



Standard Specification for Fuel Oil Meters of the Volumetric Positive Displacement Type¹

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1. Scope

1.1 This specification provides the minimum requirements for the design, fabrication, pressure rating, marking, and testing for fuel oil meters (volumetric positive displacement type).

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The following safety hazards caveat pertains only to the test method section of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

F722 Specification for Welded Joints for Shipboard Piping Systems

2.2 *ASME Standards:*³

ASME/ANSI B2.1 Pipe Threads (Except Dryseal)

ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 Pressure Vessels

¹ This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

ASME Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications

B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250

B16.3 Malleable Iron Threaded Fittings: Classes 150 and 300

B16.4 Gray Iron Threaded Fittings: Classes 125 and 150

B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

B16.11 Forged Fittings, Socket-Welding and Threaded

B16.34 Valves — Flanged, Threaded, and Welding End

B31.1 Power Piping

2.3 *MSS Standard:*⁴

MSS SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions

2.4 *API Standard:*⁵

Code No. 1101 Measurement of Petroleum Liquid Hydrocarbons by Positive Displacement Meter

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *fuel oil meter (volumetric positive displacement type), n*—device intended to indicate the volume of liquid fuel oil delivered to a fuel distribution system over a period of time.

3.1.2 *maximum allowable working pressure (MAWP), n*—maximum system pressure to which a fuel oil meter may be subjected.

4. Ordering Information

4.1 Orders for products under this specification shall include the following applicable information:

4.1.1 Title, number, and date of this specification.

4.1.2 Operating pressure (psi) and temperature ($^{\circ}$ F).

4.1.3 End connection and size.

4.1.4 Maximum capacity required.

4.1.5 Type of fuel service.

4.1.6 Materials—external and internal.

⁴ Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602, <http://www.mss-hq.org>.

⁵ Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, <http://www.api.org>.

4.1.7 Other test requirements.

4.1.8 Qualification test reports as required.

5. Materials and Manufacture

5.1 Fuel oil meter casings, as well as any pressure-retaining parts, shall be constructed of ferrous material as listed in Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code. All other parts shall be constructed of materials suitable for the service intended. Fasteners in contact with interior fluid shall be of corrosion-resistant steel.

5.2 Seals and associated parts shall be of materials suitable for the service and the fluid to be measured.

5.3 Manufacture:

5.3.1 Fuel oil meters with end fittings in compliance with ASME Standards B2.1, B16.1, B16.3, B16.4, B16.5, B16.11, or B16.34 as appropriate may be used within the pressure-temperature ranges permitted by the applicable standard provided the meter housing is satisfactory for these conditions.

5.3.2 Threaded fittings above two nominal pipe size (NPS) and socket welded flanges above 3 NPS shall not be used in fuel oil meters with a MAWP above 150 psig (1 N/mm²) and for service above 150°F (65°C).

5.4 Welding procedure qualification, welder performance qualification, and welding materials shall be in accordance with ASME B31.1 and Section IX of the ASME Code. Brazing or soldering shall not be used.

6. Other Requirements

6.1 Components:

6.1.1 The meter shall consist of a housing with measuring mechanism and a register with counter mechanism.

6.1.1.1 *Measuring Chamber*—The measuring chamber for all meters shall be so constructed as not to show distortion under maximum allowable working pressure in any manner, or to affect the sensitivity of the meter.

6.1.1.2 *Adjusting Device*—The meter shall be provided with an adjusting device for changing the registered quantity to attain desired calibration. The adjustment setting shall have provisions for locking and shall not change during the meter life except by manual readjustment. The adjusting device shall be noncyclical and shall permit adjustment without disassembly of the mechanism except for removal of adjusting device cover plate. The plate shall be sealed by means of a lead seal. The meter shall be capable of calibration adjustment over a minimum range of 5 %.

6.1.1.3 *Direction Marking of Meter*—Directions for positive and negative adjustment shall be permanently marked on the meter.

6.1.1.4 *Register*—The register shall be of the direct-reading type. The register shall have a nonsetback total indicator and a setback-type run indicator, so that individual runs can be registered without affecting the total of all runs, as shown on the total indicator. The total indicator shall have a minimum of eight figures, and the setback run indicator shall have a minimum of five figures. Reset digits shall have a minimum height of ½ in. (13 mm) and shall not be coated with fluorescent paint. The indicating register shall read in U.S.

gallons of 231 in.³ (3.785 41 × 10⁻³ m³) each. The register shall be isolated from the fluid.

6.1.1.5 *Register Face*—The register shall have a transparent, colorless plastic face of such size that all digits shall be easily read. Glass shall not be used.

6.2 Rating, Design, and Fabrication:

6.2.1 The maximum allowable working pressure-temperature rating (MAWP) for fuel oil meters conforming to this standard shall be established by at least one of the following methods:

6.2.1.1 Proof test in accordance with the requirements prescribed in Paragraph UG-101 of Section VIII of the ASME Code. If burst-type tests as outlined in Paragraph UG-101(m) are used, it is not necessary to rupture the component. In this case, the value of *B* to be used in determining the MAWP shall be the maximum pressure to which the component was subjected without rupture. Components that have been subjected to a hydrostatic proof test shall not be offered for sale.

6.2.1.2 The water temperature shall not exceed 125°F (52°C) during the test.

6.2.2 Design calculations are in accordance with the requirements prescribed in Section VIII, Division 1, of the ASME Code.

6.3 Where welded construction is used for the fabrication of pressure containing parts, welded joint design details shall be in accordance with Section VIII, Division 1, of the ASME Code and Specification F722. Except for fillet welds, all welds shall be full penetration welds extending through the entire thickness of the shell.

6.4 Inlet and outlet connections consisting of welded flanges and fittings shall be in accordance with Specification F722. When radiography is required (see 10.2), all welds shall be butt welds for Class I piping as required by Specification F722, except packing cylinders, drains, and similar ancillary connections may be attached by fillet or socket welds.

6.5 *Capacity*—The maximum capacity of the meter shall be as specified by the manufacturer.

6.6 *Pressure Drop*—The maximum pressure drop between the meter inlet and outlet shall not exceed 5 psi (34 kPa) as certified by testing in accordance with 8.1.1.2.

6.7 *Error, Normal Flow*—For flow rate and calibration setting between 5 and 100 % of maximum capacity, the error of the meter shall not exceed 0.1 % for any one predetermined flow rate and accuracy setting.

6.8 *Maintainability*—The meter shall be so designed as not to require special tools for overhaul and repair.

7. Workmanship, Finish, and Appearance

7.1 Meter shall have all burrs or sharp edges removed and shall be cleaned of all loose metal chips and other foreign substances.

7.2 *Treatment and Painting*—The exterior surface of the meter shall be treated and painted in accordance with best commercial practice.