



***TANZANIA DRAFT STANDARD***

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***MEDC 11(5509) P3- Standard Specification for Fuel Oil Meters of the Volumetric Positive Displacement Type***

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# Standard specification for fuel oil meters of the volumetric positive displacement type

## 0 Foreword

Oil and natural gas have been utilized by humankind for thousands of years. Recently in Tanzania discovery of these resources is considered to have started. It is impossible to predict how long the petroleum age will last, but the projections above clearly indicate that for next several decades fossil fuels will continue as the main source of energy for the world development.

Due to growth of petroleum and service sector such as fuel oil supply in the country lead to high importation of different flow measuring equipment such as fuel Oil Meters. In order to control the quality of these imported fuel oil meters it is important to develop this standard.

During the preparation of this draft Standard, assistance was derived from the following standard: ASTM F 1172-88(2015) – Standard Specification for Fuel Oil Meters of the Volumetric Positive Displacement Type

## 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 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 and health practices and determine the applicability of regulatory limitations prior to use.

## 2. 0. Terminology

Definitions of Terms Specific to This Standard:

- i)** Fuel oil meter (volumetric positive displacement type) — device intended to indicate the volume of liquid fuel oil delivered to a fuel distribution system over a period of time.
- ii)** Maximum allowable working pressure (MAWP) — maximum system pressure to which a fuel oil meter may be subjected.

## 3 Ordering Information

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

- i)** Title, number, and date of this specification.
- ii)** Operating pressure (bars) and temperature (°C).
- iii)** End connection and size.
- iv)** Maximum capacity required.
- v)** Type of fuel service.
- vi)** Materials-external and internal.
- vii)** Other test requirements.

## 4 Materials and Manufacture

**4.1.1** Fuel oil meter casings, as well as any pressure-retaining parts, shall be constructed of ferrous material. 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.

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

### 4.2 Manufacture:

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 1 N/mm<sup>2</sup> and for service above 65°C.

## 5 Other Requirements

### 5.1 Components:

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

- 5.1.1** 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.
- 5.1.2** 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 non-cyclical 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 %.
- 5.1.3** Direction Marking of Meter — Directions for positive and negative adjustment shall be permanently marked on the meter.
- 5.1.4** Register—the register shall be of the direct-reading type. The register shall have a non-set back 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 13 mm and shall not be coated with fluorescent paint. The indicating register shall read in  $3.78541 \times 10^{-3} \text{ m}^3$  each. The register shall be isolated from the fluid.
- 5.1.5** 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.

### 5.2 Rating, Design, and Fabrication:

- 5.2.1** 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:
- 5.2.2** If burst-type tests are used, it is not necessary to rupture the component. Components that have been subjected to a hydrostatic proof test shall not be offered for sale.

Minimum Hydrostatic test pressure =  $1.3 \times \text{MAWP} \times \text{LSR}$

Where LSR is the smallest ratio of the allowable stress at test temperature to the allowable stress at design temperatures of materials (Bolting is excluded except when the calculated test pressure will exceed 90% of the bolt material minimum yield strength at the test temperature.)

- 5.2.3** The water temperature shall not exceed 125°F (52°C) during the test.
- 5.2.4** Where welded construction is used for the fabrication of pressure containing parts, welded joint design details shall be full penetration welds extending through the entire thickness of the shell.
- 5.2.5** Capacity—the maximum capacity of the meter shall be as specified by the manufacturer.
- 5.2.6** Pressure Drop — the maximum pressure drop between the meter inlet and outlet shall not exceed 34 kPa.
- 5.2.7** 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.
- 5.2.8** Maintainability — the meter shall be so designed as not to require special tools for overhaul and repair.

## **6.0 Workmanship, Finish, and Appearance**

- 6.1** Meter shall have all burrs or sharp edges removed and shall be cleaned of all loose metal chips and other foreign substances.
- 6.2** Treatment and Painting—The exterior surface of the meter shall be treated and painted in accordance with best commercial practice

## **7. Number of Tests**

- 7.1.** A representative fuel oil meter of each particular design shall be certified as having undergone the following qualification tests.
- 7.2** Pressure Drop — clean fluid shall be pumped through the meter at 100 % of manufacturers rated capacity. After the flow rate has been stabilized, the measured pressure drop between the inlet and outlet of the meter shall not exceed 34 kPa.
- 7.3** Production Tests:
- 7.4** The manufacturer shall conduct test each fuel oil meter by hydrostatic test methods as described in Section 8.
- 7.5** Each meter shall be calibration tested at mid-range of flow capacity. The reading error shall not exceed 0.1 % at this flow rate.

## **8. Test Methods**

- 8.1** Hydrostatic Test — each fuel oil meter shall be given a hydrostatic shell test as follow.

Minimum Hydrostatic test pressure =  $1.3 \times \text{MAWP} \times \text{LSR}$

Where LSR is the smallest ratio of the allowable stress at test temperature to the allowable stress at design temperatures of materials used. (Bolting is excluded except when the calculated test pressure will exceed 90% of the bolt material minimum yield strength at the test temperature.)

- 8.2** The fluid temperature shall not exceed 125°F (52°C) during the hydrostatic test, and the fluid used should be nonflammable. Further, it should not cause rusting and should otherwise be compatible with the internal parts of the fuel oil meter.
- 8.3** The test arrangement shall be air free before pressurization.
- 8.4** The minimum duration of the shell test shall be 30 s at required pressure.
- 8.5** No visible leakage or structural damage shall show during the test.

## **9. Inspection**

Each finished fuel oil meter shall be visually examined and dimensionally checked to ensure that the meter corresponds to this specification

### **9.1 Nondestructive Examination of Welds:**

- 9.1.1** All welds shall be visually examined.

**9.2.2** Welded inlet and outlet connections that are equal to or greater than 4 NPS or greater than 0.375-in. nominal wall thickness which are in services greater than  $1 \text{ N/mm}^2$  and 65°C shall be 100 % radiographically examined.

## **10. Certification**

- 10.1** All meters must be approved by relevant authority before use.
- 10.2** The pressure ratings established under this specification are based upon materials of high quality

produced under regular control of chemical and physical properties by a recognized process. The manufacturer shall be prepared to certify that his product has been so produced and that the physical and chemical properties thereof, as proven by test specimens and nondestructive testing or as documented by certifications from the producer or recognized distributor of these materials, are at least equal to the requirements of the appropriate specifications.

**10.3** When specified in the purchase order or contract, the manufacturer certification shall be furnished to the purchaser stating that samples representing each lot have been manufactured, tested, and inspected in accordance with this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

## **11. Product Marking**

**11.1** Each fuel oil meter shall be permanently marked with the following:

**11.2** Manufacturers name or trademark.

**11.3** Maximum allowable working pressure-temperature rating (MAWP).

**11.4** Flow Direction—the direction of flow through the meter shall be indicated by the words inlet and outlet, a directional arrow, or both, stamped or embossed on the meter.

**11.5** Size (end connection size), may be included at the option of the manufacturer.

## **12. Quality Assurance Provisions**

The manufacturer of the fuel oil meter shall maintain the quality of the meters that are designed, tested, and marked in accordance with this specification. At no time shall a meter be sold that is marked with this standard designation that does not meet the requirements herein.

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