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ANSI/CAN/UL/ULC 25B:2024

STANDARD FOR SAFETY

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

Approved American National Standard

ANSI/UL 25B-2024

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UL Standard for Safety for Meters for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, ANSI/CAN/UL/ULC 25B

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 25B dated May 31, 2024 is being issued as a new joint US/Canada Standard reflecting the latest ANSI and SCC approval dates and incorporating the proposal dated September 15, 2023.

The new requirements are substantially in accordance with Proposal(s) on this subject dated September 15, 2023.

No Text on This Page

ANSI/UL 25B-2024

MAY 31, 2024

ANSI/CAN/UL/ULC 25B:2024

Standard for Meters 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 Meters for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL 25B.

First Edition – July, 2014

Second Edition

May 31, 2024

This ANSI/CAN/UL/ULC Safety Standard consists of the Second Edition.

The most recent designation of ANSI/UL 25B as an American National Standard (ANSI) occurred on May 31, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This Standard has been designated as a National Standard of Canada (NSC) on May 31, 2024.

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Preface

This is the Second Edition of ANSI/CAN/UL/ULC 25B, Standard for Meters for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil.

ULSE is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO). ULC Standards is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL/ULC 25B Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

Annex A, identified as Normative, forms a mandatory part of this Standard.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This Second Edition joint American National Standard and National Standard of Canada is based on, and now supersedes, the First Edition of UL 25B.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

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

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This Edition of the Standard has been formally approved by the Technical Committee (TC) on Meters for Flammable and Combustible Liquids and LP-Gas, TC 25.

This list represents the TC 25 membership when the final text in this Standard was balloted. Since that time, changes in the membership may have occurred.

TC 25 Membership

Name	Representing	Interest Category	Region
M. Ebert	Fill-Right Company	Producer	USA
D. Karimov	Advanced Flow Solutions, Inc.	Producer	USA
M. Kawate	UL Standards & Engagement	TC Project Manager – Non-voting	USA
W. Koch	Technology Resources International	General Interest	USA
P. Legault	Integrated Review Services – Consulting	General Interest	Canada
M. Mailvanganam	M Mailvanganam	General Interest	Canada
K. Moriarty	National Renewable Energy Laboratory	Government	USA
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This Standard is intended to be used for conformity assessment.

The intended primary application of this Standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

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INTRODUCTION

1 Scope

1.1 These requirements cover positive displacement liquid meters for use with motor fuels. Motor fuels, as defined by these requirements, include one or more of the fuels described in 1.3.

1.2 Meters for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil shall be constructed to comply with the following:

a) The requirements defined in the Standard for Meters for Flammable and Combustible Liquids and LP-Gas, UL/ULC 25; and

b) The requirements in this Standard.

1.3 Meters covered by these requirements are intended for use with one or more of the following as applicable:

a) Diesel fuel, which includes renewable diesel and diesel/biodiesel blends with nominal biodiesel concentrations up to 5 % (B0-B5) formulated in accordance with the Standard Specification for Diesel Fuel Oils, ASTM D975;

b) Diesel/biodiesel, renewable diesel/biodiesel blends, blends with nominal biodiesel concentrations from 5 % up to 20 % (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, ASTM D3699; or

e) Fuel oil (heating oil) formulated in accordance with the Standard Specification for Fuel Oils, ASTM D396.

1.4 Products covered by this Standard are intended to be installed and used in accordance with the applicable Codes and Regulations as determined by the Authority Having Jurisdiction (AHJ), such as, but not limited to:

a) In the United States:

1) Flammable and Combustible Liquids Code, NFPA 30;

2) Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A;

b) In Canada:

1) The National Fire Code of Canada;

2) Provincial or other Regulations.

1.5 These requirements do not cover:

a) Meters for use with fuels other than as described in 1.3;

b) Velocity meters, head meters, or area meters;

c) Meters for use in centralized fuel oil distribution systems; and

d) Meter components incorporating electrical circuits except those meeting intrinsically safe or explosion standards.

1.6 Determinations of the suitability of registers, counters, or computers used or provided with these meters, or the accuracy of measurement resulting from or required in actual application are not within the scope of these requirements.

1.7 For requirements for meters for gasoline/ethanol blends with nominal ethanol concentrations above 10 %, refer to the Standard for Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL/ULC 25A, for additional requirements.

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 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Referenced Publications

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.

4.2 The following publications are referenced in this Standard:

ASME B1.20.1, *Pipe Threads, General Purpose*

ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*

ASTM A653/A653M, *Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvannealed) by the Hot Dip Process*

ASTM B858, *Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys*

ASTM D396, *Standard Specification for Fuel Oils*

ASTM D471, *Standard Specification for Standard Test Method for Rubber Property – Effects of Liquids*

ASTM D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*

ASTM D975, *Standard Specification for Diesel Fuel Oils*

ASTM D3699, *Standard Specification for Kerosine*

ASTM D6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*

ASTM D7467, *Standard Specification for Diesel Fuel Oil, Biodiesel Blends (B6 – B20)*

CSA C22.2 No. 0.15, *Adhesive Labels*

NFPA 30, *Flammable and Combustible Liquids Code*

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*

NFC, *National Fire Code of Canada*

UL/ULC 25, *Meters for Flammable and Combustible Liquids and LP-Gas*

UL/ULC 25A, *Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 -E85)*

UL 87B, *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 157, *Gaskets and Seals*

UL 969, *Marking and Labeling Systems*

UL 1332, *Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment*

5 Glossary

5.1 For the purpose of this Standard the following definitions apply.

5.2 AUTHORITY HAVING JURISDICTION (AHJ) – The governmental body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

5.3 DIESEL/BIODIESEL BLENDS – Blended fuels composed of a diesel component and a biodiesel component. The numerical value corresponding to the biodiesel component determines the blend rating (such as B20 for 20 % biodiesel, 80 % diesel).

5.4 SEALS, DYNAMIC – A seal that is subject to mechanical movement or other applied forces that result in movement or flexing of the seal under normal use conditions.

5.5 SEALS, STATIC – A seal that is not subject to mechanical movement or other applied forces other than compression forces that are applied during installation and maintained during normal use conditions.

CONSTRUCTION

6 General

6.1 A meter shall be constructed for a minimum working pressure of 345 kPa (50 psig), and an ultimate rupture pressure of not less than five times the rated working pressure.

6.2 Fluid confining parts, except gaskets and seals, shall be constructed of metallic materials.

6.3 A meter shall be constructed for an operating ambient temperature within the range of minus 29 °C to 52 °C (minus 20 °F to 125 °F).

7 Assembly

7.1 A meter shall be assembled as a unit and shall include all of the components necessary for its intended function.

7.2 If a meter requires the use of special pipe flanges, gaskets, bolts, or other special fittings or parts for making a proper installation, such parts shall be furnished by the manufacturer with each meter.

7.3 A brazing material used for joining fluid-confining parts of a meter shall have a melting point (solidus temperature) exceeding 538 °C (1000 °F).

8 Materials

8.1 Metallic materials

8.1.1 General

8.1.1.1 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. See the Long Term Exposure Test, Section 14.

8.1.1.2 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, 8.1.2.

8.1.1.3 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.

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

8.1.2 Atmospheric corrosion

8.1.2.1 Metallic materials used for fluid confining parts shall be resistant to atmospheric corrosion. In addition, metallic materials that are required to operate to address safety shall be resistant to atmospheric corrosion. Ferrous materials of a thickness specified in the following items are acceptable for the preceding when uncoated:

a) A casting having a wall thickness of not less than 6.35 mm (1/4 in) if shown by production test to be free of leakage;

b) Standard pipe and fittings conforming to ASME B36.10M; and

c) Fabricated sheet steel parts having a minimum wall thickness of 2.36 mm (0.093 in).

8.1.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in 8.1.2.3.

8.1.2.3 Cadmium plating shall not be less than 0.0076 mm (0.0003 in) thick, and zinc plating shall not be less than 0.0127 mm (0.0005 in) 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 0.0038 mm (0.00015 in) thick. Metallic parts are considered to comply with 8.1.2.1 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 ASTM A653/A653M; or

b) Coatings which have been determined to be equivalent to G90 under the requirements of UL 1332.

8.1.2.4 A metallic material other than as described in 8.1.2.1 – 8.1.2.3 shall be painted or protected in a manner that has been determined to be equivalent.

8.2 Nonmetallic materials

8.2.1 General

8.2.1.1 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.

8.2.1.2 Gaskets or seals shall be designated as dynamic and/or static seals. See 5.4 and 5.5 respectively. If the type of seal cannot be determined, then the material shall be treated as both a static and a dynamic seal.

8.2.1.3 Gaskets and seals shall comply with the requirements as outlined in Nonmetallic materials – material level, 8.2.2, and Nonmetallic materials – system level, 8.2.3.

8.2.1.4 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.

8.2.2 Nonmetallic materials – material level

8.2.2.1 Static seals

8.2.2.1.1 Static seals shall be evaluated in accordance with UL 157, modified as indicated in 8.2.2.1.2 – 8.2.2.1.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

8.2.2.1.2 A static seal shall be constructed of a material that is acceptable in accordance with the scope of UL 157.

8.2.2.1.3 Static seals shall be subjected to the Volume Change and Extraction Test in accordance with 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 Annex A; and

c) For all materials, the average volume change for a gasket or seal material shall not exceed 40 % swell (increase in volume) or 1 % shrinkage (decrease in volume). In addition, the weight loss shall not exceed 10 %. For coated fabrics, alternate limits can be used with the average volume change not exceeding 60 % swell or 5 % shrinkage, and the weight loss shall not exceed 20 %. There shall be no visual evidence of cracking or other degradation as a result of the exposure for any material including coated fabrics.

8.2.2.1.4 Static seals shall be subjected to the Compression Set Test in accordance with 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 (c)] while compressed for the entire test duration. No oven conditioning is required.

c) The applicable test fluids shall be as described in Annex A.

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 %. For coated fabrics, alternate limits can be used with the average compression set not exceeding 70 %.

Exception: This requirement does not apply to composite gasket or thermoplastic materials as defined in accordance with UL 157.

8.2.2.2 Dynamic seals

8.2.2.2.1 Dynamic seals shall be evaluated in accordance with UL 157, modified as indicated in 8.2.2.2.2 – 8.2.2.2.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

8.2.2.2.2 A dynamic seal shall be constructed of a material that is acceptable in accordance with the scope of UL 157.

8.2.2.2.3 Dynamic seals shall be subjected to the Volume Change and Extraction Test in accordance with 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 Annex A; and

c) For all materials, the average volume change for a gasket or seal material shall not exceed 40 % swell (increase in volume) or 1 % shrinkage (decrease in volume). In addition, the weight loss shall not exceed 10 %. For coated fabrics, alternate limits can be used with the average volume change not exceeding 60 % swell or 5 % shrinkage, and the weight loss shall not exceed 20 %. There shall be no visual evidence of cracking or other degradation as a result of the exposure for any material including coated fabrics.

8.2.2.2.4 Dynamic seals shall be subjected to the Tensile Strength and Elongation Test in accordance with 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 Annex A; and

c) For all materials, the average tensile strength and the average elongation of materials shall not be less than 60 % of the as-received values. For coated fabrics, alternate limits can be used with the average tensile strength and the average elongation not less than 30 % of the as-received values.

8.2.3 Nonmetallic materials – system level

8.2.3.1 For all materials, gaskets and seals that have been shown to comply with the applicable requirements for static seals in UL 157, or with the requirements under material level tests shall be subjected to the system level tests for the applicable component after the Long Term Exposure Test, Section 14. Static seals shall be provided in accordance with 14.2.4. Static seals that comply with specified fluids according to the UL 157 tests are not subject to the Long Term Exposure Test.

8.3 Casting impregnation materials

8.3.1 Material level

8.3.1.1 Casting impregnation materials shall be evaluated at the material level in accordance with the requirements in UL 87B.

8.3.2 System level

8.3.2.1 The casting impregnation material, applied as intended to a casting, shall comply with the Long Term Exposure Test, Section 14. The casting shall not show indications of porosity leakage at any point during or after this test.

8.4 Internal parts

8.4.1 Nonmetallic parts located internally to a fluid confining part, degradation of which would not directly result in leakage, is not required to comply with Nonmetallic materials, 8.2. The part shall be tested in accordance with 8.4.2.

8.4.2 Internal nonmetallic parts shall be tested during the Long Term Exposure Test, Section 14. During this test, the part shall not degrade to the extent that visible particles can be observed in the fluid.

9 Bodies and Covers

9.1 Plugs and other parts, other than cap screws and bolts, threaded into noncorrosion-resistant ferrous parts of a meter shall be of corrosion-resistant metal or provided with a protective coating when their function is such that they are required to be removed for adjustment, repair, or other care of the meter.

9.2 A plug, cap, or other part threaded into or on the meter body shall engage with at least four full threads.

9.3 Tapped openings for ordinary studs or cap screws used for assembly shall not extend into a fluid-confining section of a meter.

10 Register-Shaft Seals

10.1 A shaft seal provided to prevent external leakage shall not require field adjustment to maintain it tight against leakage.

11 Springs

11.1 An operating spring shall be guided and arranged to prevent binding, buckling, or other interference with its free movement. If necessary, both ends of a spring shall be closed and squared.

11.2 A spring employed in a meter to reduce the risk of leakage shall:

a) Be protected against abrasion and corrosion;

b) Demonstrate no loss in strength after being subjected to a compression force of three times that exerted by the spring in any position of its intended function.

11.3 In reference to 11.2(a), springs that are exposed to the fuels anticipated by these requirements shall comply with the applicable material requirements from Materials, Section 8. Springs not exposed to fuels, but exposed to the environment, shall comply with the atmospheric corrosion requirements in 8.1.2.

12 Piping and Fittings

12.1 Joints in wrought iron, steel, brass, or copper pipe shall be threaded, welded, or brazed. Pipe threads shall be in accordance with ASME B1.20.1.

Exception: Meters 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 23.5.

12.2 An opening threaded for attachment to a pipe shall be constructed so that a pipe threaded two threads beyond the standard number (for the size in question) shall run into the opening and shall not result in distortion of any part of the fitting.

12.3 A threaded pipe connection shall be made with litharge and glycerine cement, shellac and inert powder filler, or a pipe-joint sealing compound that is not alcohol based.

12.4 A male thread for attachment to pipe fittings shall have no shoulder within the distance specified in Table 12.1, from the beginning of the thread, including any chamfer, nor shall any shoulder prevent an additional turn being made within this distance as determined by assembling the part into a fitting within a tolerance of plus or minus one thread.

Table 12.1
Shoulder Distance from Beginning of Thread

Pipe size, ASME B36.10M nominal inches	Shoulder distance	
	mm	(in)
1/8	9.5	(3/8)
1/4, 3/8	14.3	(9/16)
1/2, 3/4	19.1	(3/4)
1	23.8	(15/16)
1-1/4	24.6	(31/32)
1-1/2	25.4	(1)
2	26.2	(1-1/32)
2-1/2	38.5	(1-33/64)
3	40.1	(1-37/64)

12.5 ASTM Schedule 40 metallic pipe shall be used, and the metallic materials shall comply with Materials, Section 8.

Exception: A fitting need not comply with these requirements if it complies with the requirements specified in the Deformation Test, Section 18.

12.6 Tube fittings shall be metallic, and all metallic materials shall comply with Materials, Section 8.

12.7 Tubing shall have a minimum wall thickness in accordance with Table 12.2 in any configuration that is used.

Table 12.2
Wall Thickness for Tubing

Outside diameter		Minimum wall thickness	
mm	(in)	mm	(in)
3.17	(1/8)	0.71	(0.028)
6.35	(1/4)	0.71	(0.028)
7.94	(5/16)	0.71	(0.028)
9.53	(3/8)	0.71	(0.028)
12.70	(1/2)	0.80	(0.0315)
15.88	(5/8)	0.93	(0.0365)
19.05	(3/4)	0.98	(0.0385)
22.23	(7/8)	1.24	(0.049)
25.40	(1)	1.24	(0.049)
28.58	(1-1/8)	1.24	(0.049)
31.75	(1-1/4)	1.28	(0.0505)
34.93	(1-3/8)	1.28	(0.0505)
38.10	(1-1/2)	1.65	(0.065)

PERFORMANCE

13 General

13.1 A representative sample of each size and specific design of meter shall be subjected to the tests described in these requirements. Additional samples of parts constructed of nonmetallic materials, such as gaskets and other seal materials, are generally required for physical and chemical tests.

13.2 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 shall be used, the test fluid shall be prepared as described in Annex A.

13.3 For hydrostatic strength tests, the tests shall be conducted using water as the test fluid.

13.4 To reduce the effects of seal dry out due to removal of the test fluid after specific tests, the tests given in the test sequence of 13.5 shall be started within 4 hours of removal of the 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.

13.5 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 shall be performed on samples that were subjected to the Long Term Exposure Test, Section 14. One sample of the meter is required for each applicable test fluid, and that sample shall then be subjected to the sequence.

a) Long Term Exposure Test, Section 14;

b) High Pressure Leakage Test, Section 15;

c) Endurance Test – Meters, Section 16;

d) High Pressure Leakage Test, Section 15;

e) Hydrostatic Strength Test, Section 17.

14 Long Term Exposure Test

14.1 General

14.1.1 The test outlined in 14.2 – 14.4 shall be performed on one or two samples of the device. If the product is rated for use with diesel fuel (B0 – B5), a diesel/biodiesel blend above 5 % but not greater than 20 % biodiesel (B6 – B20), kerosene or fuel oil, then the test shall be performed using the FB25a test fluid. If the product is rated for use with biodiesel (B99.9/B100), then the test shall be performed using the B100a test fluid. See Annex A.

14.2 Samples

14.2.1 Samples of complete meters shall be tested. All inlet and outlet openings of the samples shall be sealed in accordance with 14.2.3.

14.2.2 If platings or coatings are used internal to the device, additional samples may be used. See 14.4.2.

14.2.3 Closures shall be provided to seal off inlet and outlet openings of all samples in accordance with 14.2.1. 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.

14.2.4 Any o-rings, gaskets, or other sealing materials, shall be provided and installed by the manufacturer. The 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 meter under test, but will be provided in the end product at the time of installation, a representative seal shall be provided for the test.

14.3 Method

14.3.1 The sample shall be exposed to the applicable test fluid in accordance with 14.1.1. The test fluids shall be prepared using the instructions in Annex A.

14.3.2 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 meter 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.

14.3.3 The chamber temperature shall be increased to 60 ±2 °C (140 ±3.6 °F). When the chamber reaches this temperature, the exposure period begins. The samples are exposed to the applicable test fluid at 60 ±2 °C (140 ±3.6 °F) for approximately 168 hours. At the end of this duration, the exposure period shall be halted and the chamber allowed to cool. The samples are subjected to a 345 kPa (50 psi) pressure for at least one minute. The fluid shall then be drained from the samples and observed. After this observation, the fluid shall be discarded. The samples shall be immediately refilled with new test fluid and the chamber temperature increased to 60 ±2 °C (140 ±3.6 °F) again. The total duration of the test shall equal 1,008 hours of exposure at 60 ±2 °C (140 ±3.6 °F).

14.3.4 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 test sequence as outlined in 13.5 and in accordance with 13.4. Prior to the initiation of the test sequence, the Long Term Exposure Test fluid shall be drained and discarded.

14.3.5 If the device contains any parts or surfaces that are plated or coated, if the device uses casting impregnation materials to eliminate porosity leakage, or if the device contains internal nonmetallic parts, the plating, coating, impregnation, or internal parts are tested both during and after this exposure. See 14.4.2 and 14.4.4.

14.4 Results

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

14.4.2 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. However, both the samples to be cut open and the samples to be used for the test sequence are required to complete the Long Term Exposure Test.

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

14.4.4 For internal nonmetallic parts, there shall be no visible evidence of this material in the drained test fluid.

15 High Pressure Leakage Test

15.1 A meter shall withstand, without leakage, a minimum internal liquid pressure of 1-1/2 times the maximum working pressure but not less than 518 kPa (75 psi).

15.2 The meter shall be connected to a source of liquid pressure. A positive shutoff valve and a calibrated pressure indicating device shall be installed in the pressure-supply piping. The pressure indicating device shall be installed in the piping between the shutoff valve and the meter. The outlet of the meter shall be blocked. The pressure indicating device shall comply with one of the following:

a) An analog gauge having a pressure range such that the test pressure is between 30 and 70 % of the maximum scale reading of the gauge;

b) A digital pressure transducer, or other digital gauge, that is calibrated over a range of pressure that includes the test pressure; or

c) Other device that is equivalent to the devices in (a) or (b).

Care shall be taken to completely fill the test sample with liquid and expel all air.

15.3 While the meter is under the applied test pressure, all joints, in addition to body casting surfaces, shall be examined for evidence of liquid leakage.

16 Endurance Test

16.1 A sample of the meter subjected to the Long Term Exposure Test, Section 14, shall not show evidence of leakage through a register shaft stuffing box or seal, or evidence of leakage through any joint at a pressure of 1-1/2 times its maximum working pressure, after the meter has been subjected to the conditions described in 16.2.

16.2 The meter shall be operated continuously for a total of 300 hours at the maximum working pressure. Other conditions of the test shall simulate, insofar as practicable, those of actual service. The test fluid shall be kerosene.

16.3 While the meter is under the test pressure, the register shaft stuffing box or seal and all body joints in the assembly shall be examined for evidence of leakage.

17 Hydrostatic Strength Test

17.1 A meter shall withstand, without rupture, a minimum hydrostatic pressure of five times the maximum working pressure, but not less than 1724 kPa (250 psi), for at least 1 minute.

17.2 Samples of the meter shall be connected to a source of hydrostatic pressure. A positive shutoff valve and a calibrated pressure indicating device shall be installed in the pressure-supply piping. The