ULC Standards
Normes ULC

JOINT CANADA – UNITED STATES NATIONAL STANDARD

ANSI/CAN/UL/ULC 25A:2024

STANDARD FOR SAFETY

Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85)

Approved American National Standard
ANSI

ANSI/UL 25A-2024

scc ccn

SCC FOREWORD

National Standard of Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

UL Standard for Safety for Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85), ANSI/CAN/UL/ULC 25A

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 25A, 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 25A-2024

MAY 31, 2024

ANSI/CAN/UL/ULC 25A:2024

Standard for Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85)

Prior to the first edition, the requirements for the products covered by this Standard were included in the Outline of Investigation for Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 25A.

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 25A 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.

No Text on This Page

CONTENTS

Preface

This is the Second Edition of ANSI/CAN/UL/ULC 25A, Standard for Meters for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85).

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 25A 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 25A.

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.

Our Standards for Safety are copyrighted by ULSE Inc. Neither a printed nor electronic copy of a Standard should be altered in any way. All of our Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of ULSE Inc.

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
R. Moses	Wayne Fueling Systems LLC	Producer	USA
J. Petersen	Petersen Engineering	General Interest	USA
B. Price	Gilbarco	Producer	USA
B. Swieckcki	National Propane Gas Association	General Interest	USA
L. Werner	UL Standards & Engagement	TC Chair – Non-voting	Canada
E. Wolff-Klammer	UL Solutions	Testing and Standards Org.	USA

International Classification for Standards (ICS): 17.120.01, 75.180.30, 75.160.20

For information on ULSE Standards, visit https://www.shopulstandards.com, call toll free 1-888-853-3503 or email us at ClientService@shopULStandards.com.

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.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

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 gasoline/ethanol blends with nominal ethanol concentrations up to 85 % (E0 – E85) 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) Gasoline formulated in accordance with the Standard Specification for Automotive Spark-Ignition Fuel, ASTM D4814;

b) Gasoline/ethanol blends with nominal ethanol concentrations up to 25 % ethanol (E25), consisting of gasoline formulated in accordance with the Standard Specification for Automotive Spark-Ignition Fuel, ASTM D4814, when blended with denatured fuel ethanol formulated to be consistent with the Standard Specification for Denatured Fuel Ethanol for Blending With Gasolines For Use as Automotive Spark Ignition Engine Fuel, ASTM D4806; or

c) Gasoline/ethanol blends with nominal ethanol concentrations above 25 % formulated in accordance with the Standard Specification in (b) above or formulated in accordance with the Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark Ignition Engines, ASTM D5798.

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 Products intended to be rated for use with gasoline or gasoline/ethanol blends with nominal ethanol concentrations:

a) Up to 25 % (E0 – E25) shall be evaluated using the CE25a test fluid as the only applicable test fluid;

b) Up to 40 % (E0 – E40) shall be evaluated using both the CE25a and CE40a test fluid, or;

c) Up to 85 % shall be evaluated using both the CE25a and the CE85a test fluids.

1.8 For requirements for meters for biodiesel fuel, diesel/biodiesel blends with nominal biodiesel concentrations up to 20 % (B20), refer to the Standard for Meters for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL/ULC 25B 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 D4806, *Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel*

ASTM D4814, *Standard Specification for Automotive Spark-Ignition Engine Fuel*

ASTM D5798, *Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines*

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

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*

SAE J1681, *Recommended Practice for Gasoline, Alcohol, and Diesel Fuel Surrogates for Material Testing*

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

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

UL 87A, *Power-Operated Dispensing Devices for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up To 85 Percent (E0 – E85)*

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 BLENDING OPTION – Dispensing devices may be provided with an option that blends two specific fuels into one fuel to be dispensed. This blending occurs at the dispenser level and can be in two forms:

a) Fixed blending – Blending at the dispenser level that blends two specific fuels into one fuel to be dispensed, and that fuel to be dispensed is fixed. For example, fixed blending includes blend options where gasoline and denatured fuel ethanol can be blended to achieve E85, which is the actual dispensed fuel.

b) Variable blending – Blending at the dispenser level that blends two specific fuels into the fuel to be dispensed, but the fuel to be dispensed can be any of a number of previously set points. For example, variable blending includes blend options where gasoline and E85 can be blended to achieve E40, E60, and E85 as the actual dispensed fuel.

5.4 GASOLINE/ETHANOL BLENDS – Blended fuels composed of a gasoline component and an ethanol component. The numerical value corresponding to the ethanol component determines the blend rating (such as E85 for 85 % ethanol, 15 % gasoline).

5.5 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.

5.6 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. For all fuel ratings, see Corrosion due to fluid, 8.1.2.1. For products rated for gasoline/ethanol blends with nominal ethanol concentrations greater than 40 %, see Metallic materials – system level, 8.1.3.

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, 8.1.2.2.

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.

8.1.2 Metallic materials – material level

8.1.2.1 Corrosion due to fluid

8.1.2.1.1 All metallic materials used for fluid confining parts shall be resistant to corrosion caused by the fuels anticipated by these requirements. In addition, metallic materials, used internally in fluid confining parts, that are required to operate in some manner to address safety (e.g. plunger on a valve) shall be resistant to corrosion caused by these fuels. This requirement also applies to all tubing, piping, or other interconnection means between components. Compliance is verified by the Long Term Exposure Test, Section 14.

8.1.2.1.2 A coating or plating, applied to a base metal, shall be resistant to the action of the fuels anticipated by these requirements as determined by the Long Term Exposure Test, Section 14.

8.1.2.2 Atmospheric corrosion

8.1.2.2.1 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).

8.1.2.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in 8.1.2.2.3.

8.1.2.2.3 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 8.1.2.2 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.

8.1.2.2.4 A metallic material other than as described in 8.1.2.2.1 – 8.1.2.2.3 shall be painted or protected in a manner that has been determined to be equivalent.

8.1.3 Metallic materials – system level

8.1.3.1 Combinations of metallic materials in products rated for use with gasoline/ethanol blends with nominal ethanol concentrations greater than 40 % shall be chosen to reduce degradation due to galvanic corrosion in accordance with 8.1.3.2 – 8.1.3.4.

8.1.3.2 Table 8.1 shows the galvanic series for metallic materials exposed to a conductive solution of sea water. The most active material in a given combination will experience increased levels of corrosion, while the most passive material in the combination will experience reduced levels of corrosion. The greater the separation of the materials in the galvanic series of Table 8.1, the more pronounced the effects would be. Table 8.1 serves as a guide in selecting the appropriate test conditions based on manufacturer specified material combinations.

Table 8.1
Galvanic Series of Metal Materials

Most passive	Platinum
	Gold
	Graphite
	Silver
	Stainless Steel Type 316 (Passive)
	Stainless Steel Type 304 (Passive)
	Titanium
	13% Chromium Stainless Steel (Passive)
	76 Ni – 16 Cr –7 Fe Alloy (Passive)
	Nickel (Passive)
	Silver Solder
	M-Bronze
	G-Bronze
	70:30 Cupro Nickel
	Silicon Bronze
	Copper
	Red Brass
	Aluminum Brass
	Admiralty Brass
	Yellow Brass
	60 Ni – 30 Mo – 6 Fe – 1 Mn
	76 Ni – 16 Cr – 7 Fe Alloy (Active)
	Nickel (Active)
	Manganese Bronze
	Tin
	Stainless Steel Type 316 (Active)
	Stainless Steel Type 304 (Active)
	13% Chromium Stainless Steel (Active)
	Cast Iron
	Wrought Iron
	Mild Steel
	Aluminum 2024
	Cadmium
	Alclad

Table 8.1 Continued on Next Page

Table 8.1 Continued

	Aluminum 6053
	Aluminum 1100
	Galvanized Steel
	Zinc
	Magnesium Alloys
Most active	Magnesium
NOTE: Reprinted with permission from NACE. Based on table titled "Galvanic Series of Metals Exposed to Seawater" from NACE Corrosion Engineer's Reference Book, Third Edition © NACE International 2002.	

8.1.3.3 Plating, such as nickel plating, can be used to reduce or eliminate dissimilar metal contact areas, as long as the plating material complies with 8.1.3.2 as the contact metal. If used, the plating shall comply with the Long Term Exposure Test, Section 14.

8.1.3.4 Gaskets or nonmetallic spacers used to reduce or eliminate dissimilar metal contact areas, where permitted, shall be subjected to the applicable requirements for static seals in Nonmetallic materials, 8.2, when they are in contact with the fluid.

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 5.5 and 5.6 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 at least 30 minutes at room temperature. The sample shall not be allowed to dry out due to exposure to air. The at least 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 14.2.5. 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 87A.

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.

8.5 Blending options

8.5.1 Meters intended for use with dispensing equipment that provides for a variable blending option, at gasoline/ethanol blends with nominal ethanol concentrations above 25 %, shall be subjected to the Blending Cycling Test, Section 22.

8.5.2 Meters intended for use with dispensing equipment that provides for a fixed blending option, as gasoline/ethanol blends with nominal ethanol concentrations above 25 %, shall be evaluated in accordance with (a) or (b):

a) If intended to be located after the blending option such that it is only subjected to the final blended fuel, then the Blending Cycling Test, Section 22, is not required.

b) If intended to be located at or before the blending option such that it is subjected to different gasoline/ethanol blend levels, the meter shall be subjected to the Blending Cycling Test, Section 22.

8.5.3 Meters intended for use with dispensing equipment that provides for a variable or fixed blending of gasoline/ethanol blends with nominal ethanol concentrations below 25 % are considered acceptable without further evaluation for the blending option.

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, and

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 8.1.2.2.

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 24.5.

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 CE25a, CE40a or CE85a 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, 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 gasoline or a gasoline/ethanol blends with a nominal ethanol concentration of up to 25 % (E0 – E25), then the test shall be performed using the CE25a test fluid. If the product is rated for use with gasoline or a gasoline/ethanol blends with a nominal ethanol concentration of up to 40 percent (E0 – E40), then the test shall be performed using both the CE25a and CE40a test fluids. If the product is rated for use with gasoline/ethanol blends with ethanol concentrations of up to 85 %, then the test shall be performed using both the CE25a and the CE85a test fluids. See Annex A for the test fluids.

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 materials as specified in 14.2.4. 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 Material combinations at the product and closure interface will be as specified by the manufacturer. All closures for meters rated for gasoline/ethanol blends with nominal ethanol concentrations up to 25 or 40 % shall be fabricated of suitable materials. All closures for meters rated for gasoline/ethanol blends above 25 % shall be fabricated of the materials representing permitted material to which the device may be connected; such as aluminum closures representing aluminum tubing. Table 8.1 shall be used to determine the worst case material interactions based on the materials specified by the manufacturer. Materials specified by the manufacturer but not included in Table 8.1 shall be tested as necessary to represent worst case conditions.

14.2.5 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 shall be 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: