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JOINT CANADA – UNITED
STATES NATIONAL STANDARD

ANSI/CAN/UL/ULC 79A:2024

STANDARD FOR SAFETY

Power-Operated Pumps for Gasoline
and Gasoline/Ethanol Blends with
Nominal Ethanol Concentrations up to
85 Percent (E0 – E85)



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UL Standard for Safety for Power-Operated Pumps for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), ANSI/CAN/UL/ULC 79A

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 79A 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 November 17, 2023 and March 15, 2024.

The new requirements are substantially in accordance with Proposal(s) on this subject dated November 17, 2023 and March 15, 2024.

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ANSI/UL 79A-2024

MAY 31, 2024

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ANSI/CAN/UL/ULC 79A:2024

Standard for Power-Operated Pumps 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 Power-Operated Pumps for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 79A.

First Edition – February, 2015

Second Edition

May 31, 2024

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

The most recent designation of ANSI/UL 79A 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 date May 31, 2024.

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Preface

This is the Second Edition of ANSI/CAN/UL/ULC 79A, Standard for Power-Operated Pumps 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 79A 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 79A.

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 Power-Operated Pumps for Petroleum Dispensing Products, TC 79.

This list represents the TC 79 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 79 Membership

Name	Representing	Interest Category	Region
M. Ebert	Fill-Right Company	Producer	USA
M. Kawate	UL Standards & Engagement	TC Project Manager – Non-voting	USA
W. Koch	Technology Resources	General Interest	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 products described in [1.3](#) when used with one or more of the fuels described in [1.4](#).

1.2 Pumps 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 Power-Operated Pumps for Petroleum Dispensing Products, UL/ULC 79; and
- b) The requirements in this Standard.

1.3 This Standard sets forth minimum requirements for electrically-, hydraulically-, or pneumatically-driven power-operated pumps for use with petroleum products in the following applications:

- a) Self-contained dispensing devices and submerged pumps used in storage tanks that provide the fuel to remote control dispensing devices. They are intended for operation at discharge pressures of 345 kPa (50 psig) , or the marked maximum discharge pressure rating, when less, with the ambient and liquid temperature within the range of –29 °C (–20 °F) to 52 °C (125 °F).
- b) Dispensing systems to transfer the fuel from a tank or container to a vehicle or another container. They are intended for operation at the marked maximum discharge pressure, or less, with the ambient and liquid temperature within the range of –29 °C (–20 °F) to 52 °C (125 °F).
- c) Vapor recovery applications for dispensing devices. They are intended to operate under a vacuum at the inlet and a maximum discharge pressure of 345 kPa (50 psig), or marked discharge pressure, whichever is less.

1.4 Pumps covered by these requirements are intended for use with one or more of the following:

- 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 Specifications in (b) or formulated in accordance with the Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines, ASTM D5798, as applicable.

1.5 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;

3) National Electrical Code, NFPA 70;

b) In Canada:

1) Canadian Electrical Code, Part I Safety Standard for Electrical Installations, CSA C22.1;

2) National Fire Code of Canada;

3) Provincial or other Regulations.

1.6 These requirements do not cover:

a) Oil burner pumps, which are evaluated in accordance with:

1) In the United States: The requirements defined in the Standard for Pumps for Oil-Burning Appliances, UL 343.

2) In Canada: The requirements defined in the Guide for Investigation of Pumps for Oil-Burning Appliances, ULC/ORD-C343.

b) Pumps for engine-powered automotive equipment.

c) Pumps for marine use which are evaluated under the Standard for Mechanically and Electrically Operated Fuel Pumps for Marine Use, UL 1130.

d) Pumps for use in chemical, petrochemical, or petroleum processing plants; utility power plants; petroleum production facilities; pipeline pump stations; pipeline or marine terminals; or bulk plant distribution and related facilities.

e) Pumps used in mobile applications, such as on tank trucks, portable tanks, or portable containers mounted on vehicles.

f) Pumps rated more than 600 volts.

g) Pump assemblies also provided with a flammable liquid meter or electrically-operated shutoff valve, which are evaluated in accordance with:

1) In the United States: The requirements defined in the Standard for Power-Operated Dispensing Devices for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 87A.

2) In Canada: The requirements defined in the Standard for Power-Operated Dispensing Devices for Flammable Liquids, CSA B346.

h) Pumps intended for use with diesel fuel, biodiesel fuel, diesel/biodiesel blends, kerosene, or fuel oil, which are evaluated in accordance with the Standard for Power-Operated Pumps for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL/ULC 79B.

1.7 The pump assembly may be constructed such that it provides for the installation and use of a flammable liquid hose and hose nozzle valve.

1.8 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.

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.

2.5 Electrical components, including motors and wiring, when incorporated by a manufacturer in an assembly with a pump, and including the means provided in the pump assembly for electrical connections, shall comply with the requirements for equipment for use in hazardous locations, Class I, Group D, NFPA 70, Articles 500 and 501, in the United States; or CSA C22.1, in Canada.

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, *Standard 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 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 E28, *Standard Test Method for Softening Point of Resins Derived from Pine Chemicals and Hydrocarbons, by Ring-and-Ball Apparatus*

ASTM E230/E230M, *Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples*

CSA B346, *Power-Operated Dispensing Devices for Flammable Liquids*

CSA C22.1, *Canadian Electrical Code, Part I Safety Standard for Electrical Installations*

CSA 22.2 No. 0.15, *Adhesive Labels*

CSA 22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

CSA C22.2 No. 14, *Industrial Control Equipment*

CSA C22.2 No. 38, *Thermoset-Insulated Wires and Cables*

CSA C22.2 No. 75, *Thermoplastic-Insulated Wires and Cables*

CSA C22.2 No. 66.1, *Low Voltage Transformers – Part 1: General Requirements*

CSA C22.2 No. 66.3, *Low Voltage Transformers – Part 3: Class 2 Transformers*

CSA C22.2 No. 77, *Motors with Inherent Overheating Protection*

CSA C22.2 No. 100-04, *Motors and Generators*

CSA C22.2 No. 153, *Electrical Quick-Connect Terminals*

CSA C22.2 No. 274, *Adjustable Speed Drives*

CSA LTR No. E-013, *List of Technical Requirements for Motors and Generators for Use in Class I, Divisions 2, and Class II, Division 2, Hazardous Locations*

NFC, *National Fire Code of Canada*

NFPA 30, *Flammable and Combustible Liquids Code*

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

NFPA 70, *National Electrical Code*

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

UL 44, *Thermoset-Insulated Wires and Cables*

UL/ULC 79B, *Meters Power-Operated Pumps for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil*

UL 83, *Thermoplastic-Insulated Wires and Cables*

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

UL 101, *Leakage Current for Appliances*

UL 157, *Gaskets and Seals*

UL 310, *Electrical Quick-Connect Terminals*

UL 330A, *Hose and Hose Assemblies for Use With Dispensing Devices Dispensing Gasoline and Gasoline/Ethanol Blends With Nominal Ethanol Concentrations Up To 85 Percent (E0 – E85)*

UL/ULC 331A, *Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85)*

UL 343, *Pumps for Oil-Burning Appliances*

UL 353, *Limit Controls*

UL 508, *Industrial Control Equipment*

UL 674, *Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations*

UL 746A, *Polymeric Materials – Short Term Property Evaluations*

UL 746B, *Polymeric Materials – Long Term Property Evaluations*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 796, *Printed Wiring Boards*

UL 969, *Marking and Labeling Systems*

UL 1004-1, *Rotating Electrical Machines – General Requirements*

UL 1004-2, *Impedance Protected Motors*

UL 1004-3, *Thermally Protected Motors*

UL 1004-7, *Electronically Protected Motors*

UL 1130, *Mechanically and Electrically Operated Fuel Pumps for Marine Use*

UL 1836, *Outline for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, and Zone 22 Hazardous (Classified) Locations*

UL 2111, *Overheating Protection for Motors*

UL/ULC 2586A, *Hose Nozzle Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85)*

UL 5085-1, *Low Voltage Transformers – Part 1: General Requirements*

UL 5085-3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

UL 60335-1, *Safety of Household and Similar Electrical Appliances, Part 1: General Requirements*

UL 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

UL 61800-5-1, *Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal, and Energy*

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 fuel composed of a gasoline component and an ethanol component. The numerical value corresponding to the ethanol component percentage determines the blend rating (such as E85 for 85 % ethanol, 15 % gasoline).

5.5 **HAZARDOUS LOCATIONS** – Locations in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixture.

5.6 **INTRINSICALLY SAFE CIRCUIT** – A circuit incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. Abnormal conditions include unintentional damage to any part of the equipment or wiring, insulation or other malfunction of electrical components, application of overvoltage, adjustment and maintenance operations, and other similar conditions.

5.7 **LINE-VOLTAGE CIRCUIT** – A circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage circuit.

5.8 **LOW-VOLTAGE CIRCUIT** – A circuit involving a peak open-circuit potential of not more than 42.2 volts supplied by:

- a) A battery;
- b) A Class 2 transformer; or
- c) A combination of a transformer and a fixed impedance that, as a unit, complies with the performance requirements for Class 2 transformers in accordance with:
 - 1) In the United States:
 - i) UL 5085-1; and
 - ii) UL 5085-3.
 - 2) In Canada:
 - i) CSA C22.2 No. 66.1; and
 - ii) CSA C22.2 No. 66.3.

A circuit derived from a line-voltage circuit by connecting a resistance in series with the supply circuit as a means of limiting the voltage and current is not a low-voltage circuit.

5.9 RAINPROOF ENCLOSURE – An enclosure that prevents the entrance of a beating rain to the extent that there is no wetting of electrical parts and no water enters a compartment housing field installed wiring.

5.10 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.

5.11 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 Assembly

6.1 The construction of a pump shall be such that parts can be assembled in the intended manner after being dismantled to the extent needed for replacement of parts or for other maintenance or servicing.

6.2 When a pump requires the use of special pipe flanges, gaskets, bolts, or other special fittings or parts for making connections, such parts shall be furnished as part of the pump assembly.

6.3 A product shall be formed and assembled so that it has the strength and rigidity required to resist the abuses to which it is subjected without resulting in the risk of fire, electric shock, or injury to persons due to total or partial collapse with:

- a) Resulting reduction of spacings;
- b) Loosening or displacement of parts; or
- c) Other defects.

6.4 A pump-motor assembly to be shipped from the manufacturer disassembled shall be provided with the marking described in [77.9](#).

7 Materials

7.1 Metallic materials

7.1.1 General

7.1.1.1 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, [7.1.2.1](#). For products rated for gasoline/ethanol blends with nominal ethanol concentrations greater than 40 %, see Metallic materials – system level, [7.1.3](#).

7.1.1.2 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, [7.1.2.2](#).

7.1.1.3 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 coating or plating containing lead shall be used, such as terne-plated steel.

7.1.2 Metallic materials – material level

7.1.2.1 Corrosion due to fluid

7.1.2.1.1 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, 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 [43](#).

7.1.2.1.2 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 [43](#).

7.1.2.2 Atmospheric corrosion

7.1.2.2.1 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 the 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).

7.1.2.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in [7.1.2.2.3](#).

7.1.2.2.3 Cadmium plating shall not be less than 0.008 mm (0.0003 in) thick, and zinc plating shall not be less than 0.013 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 [7.1.2.2.1](#) 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.

7.1.2.2.4 A metallic material other than as described in [7.1.2.2.1](#) – [7.1.2.2.3](#) shall be painted or protected in a manner that has been determined to be equivalent.

7.1.3 Metallic materials – system level

7.1.3.1 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 [7.1.3.2](#) – [7.1.3.4](#).

7.1.3.2 [Table 7.1](#) 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 7.1](#), the more pronounced the effects would be. [Table 7.1](#) serves as a guide in selecting the appropriate test conditions based on manufacturers specified material combinations.

Table 7.1
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
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Table 7.1 Continued on Next Page

Table 7.1 Continued

Most active	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
	Aluminum 6053
	Aluminum 1100
	Galvanized Steel
	Zinc
	Magnesium Alloys
	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.	

7.1.3.3 Plating, such as nickel plating, can be used to reduce or eliminate dissimilar metal contact areas, as long as the plating material complies with [7.1.3.2](#) as the contact metal. If used, the plating shall comply with the Long Term Exposure Test, Section [43](#).

7.1.3.4 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, [7.2](#), when they are in contact with the fluid.

7.2 Nonmetallic materials

7.2.1 General

7.2.1.1 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.

7.2.1.2 Gaskets and seals shall be designated as dynamic and/or static seals. See [5.10](#) and [5.11](#) respectively. If the type of seal cannot be determined, then the material shall be treated as both a static and a dynamic seal.

7.2.1.3 Gaskets and seals shall comply with the requirements as outlined in Nonmetallic materials – material level, [7.2.2](#), and Nonmetallic materials – system level, [7.2.3](#).

7.2.1.4 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.

7.2.1.5 The reliability of a nonmetallic, pneumatic pressure confining part shall be determined for each application. Among the factors to be taken into consideration with the reliability of a nonmetallic material are:

- a) Mechanical strength;
- b) Resistance to impact;
- c) Resistance to distortion and creeping at temperature and pressures to which the material is subjected under conditions of intended use; and
- d) Dimensional stability.

Compliance with this requirement is determined by the tests of Sections [54](#), [70](#), [71](#), and [72](#).

7.2.2 Nonmetallic materials – material level

7.2.2.1 Static seals

7.2.2.1.1 Static seals shall be evaluated in accordance with UL 157, modified as indicated in [7.2.2.1.2 – 7.2.2.1.4](#). If a specific material complies with these requirements, the material can be considered to be qualified for system testing.

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

7.2.2.1.3 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 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.

7.2.2.1.4 Static seals shall be subjected to the Compression Set Test in accordance with UL 157, except for the following modifications:

- a) The test durations 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; and
- 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.

7.2.2.2 Dynamic seals

7.2.2.2.1 Dynamic seals shall be evaluated in accordance with UL 157, modified as indicated in [7.2.2.2.2 – 7.2.2.2.4](#). If a specific material complies with these requirements, the material can be considered to be qualified for system testing.

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

7.2.2.2.3 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 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.

7.2.2.2.4 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.

7.2.3 Nonmetallic materials – system level

7.2.3.1 For all materials, gaskets and seals that have been shown to comply with the applicable requirements for static seals in UL 157, along with the exceptions as noted in [7.2.2.1](#), the requirements of the Long Term Exposure Test, Section [43](#), shall be waived .

7.3 Casting impregnation materials

7.3.1 Material level

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

7.3.2 System level

7.3.2.1 The casting impregnation material, applied as intended to a casting, shall comply with the Long Term Exposure Test, Section [43](#). The casting shall not show indications of porosity leakage at any point during or after this test.

7.4 Internal parts

7.4.1 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, [7.2](#). The part shall be tested in accordance with [7.4.2](#).

7.4.2 Internal nonmetallic parts shall be tested during the Long Term Exposure Test, Section [43](#). During this test, the part shall not degrade to the extent that visible particles can be observed in the fluid.

7.5 Blending options

7.5.1 Pumps 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 [73](#).

7.5.2 Pumps intended for use with dispensing equipment that provides for a fixed blending option, at 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 the pump is only subjected to the final blended fuel, then the Blending Cycling Test 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 pump shall be subjected to the Blending Cycling Test, Section [73](#).

7.5.3 Pumps 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.

8 Bodies, Covers, and Heads

8.1 A pump body assembly shall withstand the Deformation Test, High Pressure Leakage Test, and Hydrostatic Strength Test requirements specified in Sections [48](#), [44](#), and [46](#), respectively. These

requirements do not apply to body sections of submersible type pumps intended to be immersed in the liquid.

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

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

8.4 A bolt or a screw hole shall not extend through the outer walls of a pump body into a liquid-handling section.

9 Drive-Shaft Seals

9.1 A stuffing box or a seal shall comply with the requirements specified in the Endurance Test – Pumps, Section [45](#).

9.2 An adjustable stuffing box, when guarded or not accessible, or when clearly visible to the operator, shall be provided with a spring-loaded follower gland or the equivalent.

9.3 An automatic spring take-up for a gland shall employ a spring made of corrosion resistant material or coated to retard corrosion.

9.4 The physical characteristics of a take-up spring shall be such that it advances the gland through not less than one-half its possible travel from its initial setting with the spring compressed.

9.5 The stuffing-box recess shall be such that packing material does not come into contact with screw threads.

10 Diaphragms

10.1 A metal part coming in contact with a diaphragm shall have no sharp edges, burrs, projections, and surfaces that are capable of chafing or abrading the diaphragm.

10.2 A pump, in which a flexible diaphragm, bellows, or similar construction constitutes the only fluid seal, shall be constructed such that the atmospheric side of the diaphragm or bellows is enclosed in a casing construction to reduce external leakage in the event of a diaphragm or bellows rupture, or shall have provisions for connection of a vent pipe or tubing intended to be routed to the outdoors or other location determined to be equivalent. See [77.8](#).

11 Springs

11.1 An operating spring shall be guided and arranged to reduce binding, buckling, or other interference with its free movement. When required, ends of a spring shall be closed and squared.

11.2 A spring employed in a pump 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.