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ANSI/CAN/UL/ULC 567B:2024

JOINT CANADA – UNITED
STATES NATIONAL STANDARD

STANDARD FOR SAFETY

Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil



ANSI/UL 567B-2024

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UL Standard for Safety for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings 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 567B

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 567B 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 August 4, 2023.

The new requirements are substantially in accordance with Proposal(s) on this subject dated August 4, 2023.

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ANSI/UL 567B-2024

MAY 31, 2024



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ANSI/CAN/UL/ULC 567B:2024

**Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-
Connection Fittings 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 Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL 567B.

First Edition – March, 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 567B 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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CONTENTS

Preface5

INTRODUCTION

1 Scope7
2 Components8
3 Units of Measurement8
4 Referenced Publications8
5 Glossary.....9

CONSTRUCTION

6 General10
7 Materials10
 7.1 Metallic materials.....10
 7.2 Nonmetallic materials.....11
 7.3 Casting impregnation materials.....13
 7.4 Internal parts14
8 Swivel Connectors and Emergency Breakaway Fittings14
9 Pipe-Connecting Fittings.....14
10 End Connections.....15

PERFORMANCE

11 General18
12 Long Term Exposure Test19
 12.1 General.....19
 12.2 Samples19
 12.3 Method20
 12.4 Results21
13 Electrical-Continuity Test.....21
 13.1 General.....21
 13.2 Electrical continuity measurement.....21
 13.3 Electrical continuity alternate method21
14 External Leakage Test22
15 Seat Leakage Test.....22
16 Operation Test22
17 Endurance Test.....26
18 Abuse Test.....26
19 Drop Test.....27
20 Hydrostatic Strength Test.....27
21 Pull Test.....28
 21.1 Pipe-connecting fitting.....28
 21.2 Emergency breakaway fitting.....28
22 Marking Adhesion Test29
23 Moist Ammonia-Air Stress Cracking Test.....29

MANUFACTURING AND PRODUCTION

24 General30

INSTALLATION AND OPERATING INSTRUCTIONS

25 General30

MARKING

26 General30

ANNEX A (Normative) – TEST FLUIDS

A1 Representative Aggressive Combustible Test Fuel Mixtures32

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Preface

This is the Second Edition of ANSI/CAN/UL/ULC 567B, Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings 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 567B 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.

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 567B.

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 Pipe Connectors For Petroleum Products And Lp-Gas, TC 567.

This list represents the TC 567 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 567 Membership

Name	Affiliation	Category	Region
D. Boyd	BP America Inc	Commercial/Industrial User	USA
D. Gross	Wal-Mart Stores Inc	Commercial/Industrial User	USA
W. Koch	Technology Resources International, Inc.	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 emergency breakaway fittings, swivel connectors and pipe-connecting fittings of the threadless compression type. Connectors and fittings covered by these requirements are intended only for flammable and combustible liquid service.

1.2 Emergency breakaway fittings, swivel connectors and pipe-connecting fittings 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 UL/ULC 567, and
- b) The requirements in this Standard.

1.3 A swivel connector is either a hose swivel or joint swivel. The swivel connector will allow radial movement and shall be constructed for use with the fluids shown in [1.5](#).

1.4 An emergency breakaway fitting is used between the outlet of the dispensing device and the hose nozzle valve and separates in the event that the coupling is subjected to an excessive pull force to safeguard against abnormally excessive pull force on the hose assembly and dispenser and prevent loss of liquid. An emergency breakaway fitting shall be constructed for use with the fluids shown in [1.5](#). The fittings shall be of the single-break or reconnectable type.

1.5 Emergency breakaway fittings, swivel connectors, and pipe-connecting fittings 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 ASTM D975;
- b) Diesel/biodiesel and renewable diesel/biodiesel blends with nominal biodiesel concentrations from 5 % up to 20 % (B6 – B20) formulated in accordance with ASTM D7467;
- c) Biodiesel (B99.9/B100) formulated in accordance with ASTM D6751;
- d) Kerosene formulated in accordance with ASTM D3699; or
- e) Fuel oil (heating oil) formulated in accordance with ASTM D396.

1.6 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.

1.7 These requirements do not cover devices intended for use with gasoline or gasoline/ethanol blends, which are covered under UL/ULC 567A.

1.8 These requirements do not cover devices intended for use with LP-Gas or anhydrous ammonia, which are covered under UL/ULC 567.

1.9 A hose assembly provided with a swivel connector or emergency breakaway fitting for use with fuels anticipated by these requirements shall comply with the applicable requirements in UL 330B.

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, *Standard for Pipe Threads, General Purpose (Inch)*

ASME B36.10M, *Standard for 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 D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*

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

ASTM D975, *Standard Specification for Diesel Fuel Oils*

ASTM D3699, *Kerosene formulated in accordance with the Standard Specification for Kerosene*

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 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 330B, *Hose and Hose Assemblies for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil*

UL/ULC 567, *Emergency Breakaway Fittings, Swivel Connectors, and Pipe-Connection Fittings for Petroleum Products and LP-Gas*

UL/ULC 567A, *Emergency Breakaway Fittings, Swivel Connectors, and Pipe-Connection Fittings for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85)*

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 percent biodiesel, 80 percent diesel).

5.4 **FITTING, PIPE-CONNECTING** – A fitting of the threadless compression seal-ring type for use in the assembly of dispensing devices to facilitate connection of piping or tubing. These fittings shall be made in the straight coupling style, as well as in the tee, ell, reducer, adapter, and other styles.

5.5 FITTING, RECONNECTABLE TYPE – An emergency breakaway fitting designed such that upon separation it is intended to be reconnected and reused when it is not damaged.

5.6 FITTING, SINGLE-BREAK TYPE – An emergency breakaway fitting that, upon separation, is not intended to be reconnected and reused.

5.7 HOSE SWIVEL – A swivel connector with one end attached to a hose and the other end to an appurtenance. The hose swivel will allow radial movement of the hose and/or appurtenance to prevent the hose from twisting or having torsional stress.

5.8 PRESSURE INDICATING DEVICE – As used herein, the pressure indicating device means 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).

5.9 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.

5.10 SEALS, STATIC – A seal that is not subject to mechanical movement or other applied forces other than compressing forces that are applied during installation, after which, the seal is held in place during normal use conditions.

5.11 SWIVEL CONNECTOR – A type of swivel categorized as either a hose swivel or swivel joint.

5.12 SWIVEL JOINT – A swivel connector installed in a piping system with at least one end attached to a rigid pipe or other appurtenance that is firmly affixed. The swivel joint will allow radial movement of the pipe or other appurtenance attached to the swivel to prevent torsional stress.

CONSTRUCTION

6 General

6.1 Products shall be constructed for an operating pressure of not less than 50 psig (345 kPa) for the fluid confining portion of the device and 0.5 psig (3.45 kPa) for the vapor confining portion of the device, when provided, and an ultimate rupture pressure of not less than five times the design pressure.

6.2 An emergency breakaway fitting shall be constructed to separate in the event that the coupling is subjected to a pull force not less than 100 lbf (445 N), and not to exceed 350 lbf (1557 N).

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. See the Long Term Exposure Test, Section [12](#).

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](#).

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 coatings or platings containing lead shall be used, such as terne-plated steel.

7.1.1.4 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.

7.1.2 Atmospheric corrosion

7.1.2.1 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 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 0.25 inch (6.4 mm) if shown by production test to be free from leakage;
- b) Standard pipe and fittings conforming to ASME B36.10M; and
- c) Fabricated sheet steel parts having a minimum wall thickness of 0.093 inch (2.36 mm).

7.1.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in [7.1.2.3](#).

7.1.2.3 Cadmium plating shall not be less than 0.0003 inch (0.008 mm) thick, and zinc plating shall not be less than 0.0005 inch (0.013 mm) 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 0.00015 inch (0.0038 mm) thick. Metallic parts are considered to comply with [7.1.2.1](#) 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.

7.1.2.4 A metallic material other than as described in [7.1.2.1](#) – [7.1.2.3](#) shall be painted or protected in a manner that has been determined to be equivalent.

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 or seals shall be designated as dynamic and/or static seals. See [5.9](#) and [5.10](#), 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.

7.2.2 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 level 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 duration shall be 1000 hours.
- b) The samples shall be immersed, at room temperature, in the test fluids (see item 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 compressions set is calculated and shall not exceed 45 %. 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 level 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 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.

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, 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 [12](#). Static seals shall be provided in accordance with [12.2.5](#).

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 87B.

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 [12](#). 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 [12](#). During this test, the part shall not degrade to the extent that visible particles can be observed in the fluid.

8 Swivel Connectors and Emergency Breakaway Fittings

8.1 A product shall provide electrical continuity from end-to-end so that when it is installed, continuity is provided for grounding of static charges. Such continuity shall be inherent in the construction and shall not be accomplished by a jumper wire.

9 Pipe-Connecting Fittings

9.1 A seal ring of a fitting shall not be exposed to physical damage when the sealing nut is tightened.

9.2 A fitting shall provide electrical continuity across the fitting for grounding of static charges. Such continuity shall be inherent in the construction and shall not be accomplished by a jumper wire.

9.3 A fitting for the connection of pipe or tubing shall be made to provide strength at least equal to that of a fitting constructed from one of the materials indicated in [Table 9.1](#). The wall thickness shall not be less than that specified under the appropriate column.

Table 9.1
Material and Wall Thickness of Fittings

ASME B1.20.1 Pipe size of fitting nominal in	Wall thickness, steel other than castings				Wall thickness, cast steel or malleable iron			
	Pipe fitting		Tube fitting		Pipe fitting		Tube fitting	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)
1/4	0.088	(2.24)	0.078	(1.98)	0.095	(2.41)	0.085	(2.16)
3/8	0.091	(2.31)	0.081	(2.06)	0.100	(2.54)	0.090	(2.29)
1/2	0.109	(2.77)	0.099	(2.51)	0.105	(2.67)	0.095	(2.41)
3/4	0.113	(2.87)	0.103	(2.62)	0.120	(3.05)	0.110	(2.79)
1	0.133	(3.38)	0.123	(3.12)	0.134	(3.40)	0.124	(3.15)
1-1/4	0.140	(3.56)	0.130	(3.30)	0.145	(3.68)	0.135	(3.43)
1-1/2	0.145	(3.68)	0.135	(3.43)	0.155	(3.94)	0.145	(3.68)
2	0.154	(3.91)	0.144	(3.66)	0.173	(4.39)	0.163	(4.14)
2-1/2	0.203	(5.16)	0.193	(4.70)	0.210	(5.33)	0.200	(5.08)
3	0.216	(5.49)	0.206	(5.23)	0.231	(5.87)	0.221	(5.61)

9.4 A fitting shall permit insertion of a pipe or a tube a distance equal to at least 1-1/2 times the outside diameter of the pipe or tube for which it is intended.

9.5 The distance specified in 9.4 shall be measured from the inserted end of the pipe or tube to the outside face of the seal nut after tightening to the torque specified in Table 9.2.

Table 9.2
Tightening Torque for Pipe-Connecting Fittings

Pipe or tube size nominal in	Tightening torque	
	lbf in	(N·m)
1/8	150	(17)
1/4	600	(68)
3/8	700	(79)
1/2	850	(96)
3/4	1000	(113)
1	1200	(136)
1-1/4	1450	(164)
1-1/2	1550	(175)
2	1650	(186)
2-1/2	1750	(198)
3	1800	(203)
Coaxial Connection	600	(68)

9.6 A fitting of the tee or ell form shall be constructed with integral stops, or shall be otherwise constructed to limit the distance the pipe or tube can be inserted into the fitting, thus preventing a restriction in the passage.

10 End Connections

10.1 Both ends of a swivel connector or emergency breakaway fitting shall be provided with pipe threads for connection of pipe or of pipe fittings, or with coaxial connections and shall be constructed with a section to serve as wrench flats. The minimum width of the flat surfaces shall be determined in accordance with Table 10.1.

Table 10.1
Width of Flat Surfaces

Pipe size nominal in	Raised flat surface ^a		Unraised flat surface	
	in	(mm)	in	(mm)
1/2	1/4	(6.4)	11/16	(17.5)
3/4	1/4	(6.4)	3/4	(19.1)
1	1/4	(6.4)	3/4	(19.1)
1-1/4	9/32	(7.1)	1	(25.4)
1-1/2	5/16	(7.9)	1	(25.4)
2	5/16	(7.9)	1	(25.4)

Table 10.1 Continued on Next Page

Table 10.1 Continued

Pipe size nominal in	Raised flat surface ^a		Unraised flat surface	
	in	(mm)	in	(mm)
2-1/2	1/2	(12.7)	1	(25.4)
3	19/32	(15.1)	1-1/4	(31.8)
4	19/32	(15.1)	1-1/4	(31.8)
Coaxial Connection	5/16	(7.9)	1	(25.4)

^a A raised flat is a surface with a diameter which is greater than the threaded portion of the male end of a swivel connector. The outside surface of the female end of a swivel connector or emergency breakaway fitting shall also be considered to be a raised flat.

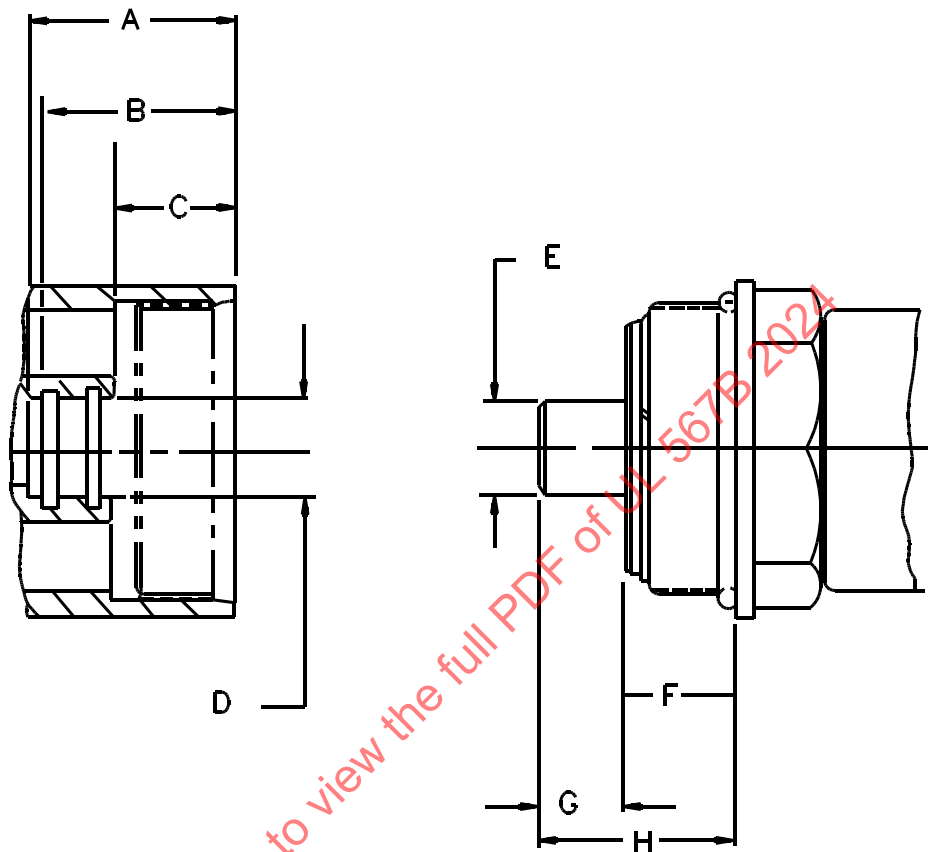
10.2 Pipe threads shall be in accordance with ASME B1.20.1.

Exception: Products 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 [26.9](#).

10.3 The male connection of a coaxial type fitting shall have a 1-7/8-12 SAE external straight thread. The female connection of a coaxial type fitting shall have a 1-7/8-12 SAE internal straight thread. Coaxial type connections shall also have the dimensions as indicated in [Figure 10.1](#).

10.4 The couplings provided on coaxial type vapor recovery hose assemblies shall have male 1-7/8 – 12-SAE straight threads when the inner hose is intended to dispense the liquid fuel into the vehicle and 1-1/4-inch – 18 SAE Straight, M34 by 1.5 metric thread or 1 inch – 11-1/2 NPT threads , as required when the outer hose is intended to dispense the liquid fuel into the vehicle. All fittings shall be designed to fit the accessories connected to the hose couplings to form a leak tight connection. If the end connections of a vapor recovery fitting do not conform to these requirements or those specified in [10.3](#), the installation instructions which accompany each fitting shall indicate the specific equipment which shall be connected to the fitting.

Figure 10.1
Coaxial Type Connection



SM398

Item	in	(mm)
A	1.45 min	(36.8 min)
B	1.26 max	(32.0 max)
C	0.78 min	(19.8 min)
D	0.668 – 0.672	(17.0 – 17.1)
E	0.660 – 0.664	(16.8 – 16.9)
F	0.78 max	(19.8 max)
G	0.56 min	(14.2 min)
H	1.31 – 1.45	(33.3 – 36.8)

PERFORMANCE

11 General

11.1 Representative samples of each size and specific construction of the product are to be subjected to the tests described in these requirements. Additional samples of parts constructed of nonmetallic materials are usually required for separate physical and chemical tests.

11.2 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](#).

11.3 Water or other liquid is used to develop the required pressure in the Hydrostatic Strength Test, Section [20](#).

11.4 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 [11.5](#) 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.

11.5 The tests in the following sequences shall be performed on one sample of a device as shown for each applicable test fluid as described in the Long Term Exposure Test, Section [12](#). The remaining tests in this standard may be performed in any order on the same samples or on additional samples as needed.

a) Reconnectable emergency breakaway fitting sequence:

- 1) Long Term Exposure Test, Section [12](#);
- 2) Electrical-Continuity Test, Section [13](#);
- 3) External Leakage Test, Section [14](#);
- 4) Pull Test – Emergency breakaway fitting, [21.2](#);
- 5) Seat Leakage Test, Section [15](#);
- 6) Endurance Test, Section [17](#);
- 7) Electrical-Continuity Test, Section [13](#);
- 8) External Leakage Test, Section [14](#);
- 9) Pull Test – Emergency breakaway fitting, [21.2](#);
- 10) Seat Leakage Test, Section [15](#); and
- 11) Hydrostatic Strength Test, Section [20](#).

b) Non-reconnectable emergency breakaway fitting sequence:

- 1) Long Term Exposure Test, Section [12](#);
- 2) Electrical-Continuity Test, Section [13](#);
- 3) External Leakage Test, Section [14](#);
- 4) Pull Test – Emergency breakaway fitting, [21.2](#);

- 5) Seat Leakage Test, Section [15](#); and
- 6) Hydrostatic Strength Test, Section [20](#).

c) Swivel connector sequence:

- 1) Long Term Exposure Test, Section [12](#);
- 2) Electrical-Continuity Test, Section [13](#);
- 3) External Leakage Test, Section [14](#);
- 4) Operation Test, Section [16](#);
- 5) Electrical-Continuity Test, Section [13](#)
- 6) External Leakage Test, Section [14](#); and
- 7) Hydrostatic Strength Test, Section [20](#).

d) Pipe-connection fitting sequence:

- 1) Long Term Exposure Test, Section [12](#);
- 2) Electrical-Continuity Test, Section [13](#);
- 3) External Leakage Test, Section [14](#);
- 4) Hydrostatic Strength Test, Section [20](#); and
- 5) Pull Test – Pipe-connecting fitting, [21.1](#).

11.6 For the External Leakage, Seat Leakage and Hydrostatic Strength tests, a calibrated pressure indicating device (as described in [5.8](#)), shall be used.

11.7 External and Seat Leakage tests on connectors or fittings intended to handle petroleum products shall use a source of aerostatic pressure such as air or nitrogen. When leakage is observed, the tests are to be repeated with kerosene, Soltrol® 170, or other liquid of comparable or lighter viscosity as the test medium.

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12 Long Term Exposure Test

12.1 General

12.1.1 The test outlined in [12.2](#) – [12.4](#) 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](#).

12.2 Samples

12.2.1 Samples of complete device shall be tested for each applicable test fluid. For non-reconnectable breakaway fittings subjected to the Pull Test, two samples are needed for each applicable test fluid. All inlet and outlet openings of the samples shall be sealed in accordance with [12.2.3](#).

12.2.2 If platings or coatings are used internal to the device, additional samples may be used. See [12.4.2](#).

12.2.3 Closures shall be provided to seal off inlet and outlet openings of all samples in accordance with [12.2.1](#). These closures shall be fabricated of suitable materials. These closures shall be fabricated of suitable materials. The closures shall be provided with a 0.25 inch (6.4 mm) 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.

12.2.4 Each pipe-connection fitting shall be made up with 24 to 36 inch (600 to 900 mm) lengths of pipe or tubing. The end of the pipe or tube engaged by the fitting shall be without threads and free of burrs, whereas the opposite end shall be provided with pipe threads. The end of the pipe shall be inserted into the fitting a distance of one-half of maximum permitted by the design. The pipe or tubing, as well as the closures at the end of the pipe or tubing pieces used, shall be fabricated of suitable materials.

12.2.5 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 device under test, but will be provided in the end product at the time of installation, a representative seal shall be provided for the test.

12.3 Method

12.3.1 The sample shall be exposed to the applicable test fluid in accordance with [12.1.1](#). The test fluids shall be prepared using the instructions in Annex A.

12.3.2 A quick connect device is connected to the 0.25 inch (6.4 mm) 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 device 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.

12.3.3 The chamber temperature is 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 is halted and the chamber is allowed to cool. The samples are subjected to a 50 psi (345 kPa) pressure for one minute. The fluid is then drained from the samples and observed in accordance with [12.4.2](#). After this observation, the fluid is discarded. The samples are then immediately refilled with new test fluid and the chamber temperature is allowed to increase 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).

12.3.4 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 [11.5](#) and in accordance with [11.4](#). Prior to the initiation of the test sequence, the Long Term Exposure test fluid is to be drained and discarded.

12.3.5 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 [12.4.2](#) and [12.4.4](#).

12.4 Results

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

12.4.2 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, Section [12](#).

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

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

13 Electrical-Continuity Test

13.1 General

13.1.1 Breakaway devices and swivel connectors shall be tested using the test method as indicated in [13.2](#) or the alternate test method in [13.3](#).

13.1.2 For assemblies with more than one swivel connector, continuity shall be measured across the entire assembly while rotating each swivel connector independently.

13.2 Electrical continuity measurement

13.2.1 The electrical resistance across a device shall not exceed 0.5 MΩ.

13.2.2 The electrical continuity determination shall be made using a resistance indicating instrument. When a swivel is being tested, the swivel shall be rotated 360° with the leads of the instrument are attached, and the highest reading obtained shall be considered the resistance of the swivel connector.

13.3 Electrical continuity alternate method

13.3.1 Breakaway couplings and swivel connectors shall not have an electrical resistance greater than 5800 Ω inch (2280 Ω/cm) when tested in accordance with [13.3.2](#).

13.3.2 The electrical resistance shall be measured by means of an appropriate ohmmeter. When a swivel is being tested, the swivel shall be rotated 360° while the leads of the ohmmeter are attached, and the highest reading obtained shall be considered the resistance of the swivel connector.

14 External Leakage Test

14.1 A device shall not leak when subjected to an aerostatic or hydrostatic source of pressure of 1-1/2 times its maximum design pressure, but not less than 75 psig (517 kPa), when tested as described below. Vapor confining components are subjected to a pressure of 0.75 psig (5.17 kPa).

14.2 The test sample is to be connected to a source of liquid or aerostatic pressure, and the opposite end shall be closed. A positive shutoff valve, and a pressure indicating device, as described in [5.8](#), shall be installed in the pressure supply piping. The pressure indicating device shall be installed between the shutoff valve and the test sample.

14.3 The sample pipe-connecting fitting made up with piping or tubing in accordance with [12.2.4](#) shall be placed on horizontal supports 30 inches (760 mm) apart. The sample is then to be tested for leakage in this position. While the test sample is under the pressure of the test liquid, sufficient load shall be placed on the fitting to cause maximum deflection of the connected pipe as permitted by the fitting design. While in the deflected position, the fitting shall be observed for leakage as described in [14.2](#).

15 Seat Leakage Test

15.1 An emergency breakaway fitting shall not leak past the seats when subjected to a hydrostatic or aerostatic test pressure starting at zero and increasing to 1-1/2 times its maximum design pressure, but not less than 75 psig (517 kPa), when tested as described below. This test is only conducted on the liquid path for vapor recovery products.

15.2 Both halves of an uncoupled sample of the emergency breakaway fitting shall be connected to a hydrostatic or aerostatic source of pressure. A positive shutoff valve, and a pressure indicating device, as described in [5.8](#), shall be installed in the pressure supply piping. The pressure indicating device shall be installed between the shutoff valve and the test sample. The pressure shall be increased gradually from zero and then maintained at 1-1/2 times the maximum design pressure, but not less than 75 psig (517 kPa). The test is then to be repeated at a pressure of 0.75 psi (5.17 kPa).

16 Operation Test

16.1 A swivel connector or emergency breakaway fitting which incorporates a swivel mechanism subjected to the Long Term Exposure Test, Section [12](#), shall be subjected to 100,000 cycles of operation as described in [16.2](#) – [16.4](#).

16.2 Prior to the test, the fluid confining portion of the sample shall be filled with kerosene or Soltrol® 170. For the duration of the test, the liquid shall be under a pressure of 50 psig (340 kPa).

16.3 The operating mechanism shall be arranged so that, during each cycle of operation, each joint of a swivel mechanism is rotated through an arc of $180 \pm 10/-0^\circ$ at a rate between 6 and 10 cycles/minute. The manufacturer may request a faster rate but it shall not exceed 30 cycles/minute. If the connector is constructed with more than one joint of a swivel mechanism, and it is not feasible to operate all joints simultaneously, then it is possible for any one joint to be operated separately. Rotation of the joint $180 \pm 10/-0^\circ$ and then back to the initial position is considered 1 cycle of operation.

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16.4 During the cycling, a 20 lbf force (89 N) shall be applied to the swivel at an angle of 45° from the plane of rotation and in such a manner that the force is applied as a bending moment at that joint. The force shall be applied at the point on the swivel farthest from the joint. When necessitated by the swivel construction, the operation test shall be conducted on additional samples of the swivel with the load applied on the opposite side of the plane of rotation. See [Figure 16.1](#) for examples.

Exception: The load does not need to be applied to the opposite side of the plane of rotation, when a product incorporates more than one swivel joint and the other swivel joint rotates preventing the load from being applied on the opposite side.

Figure 16.1
Application of Test Force for Axial Swivel

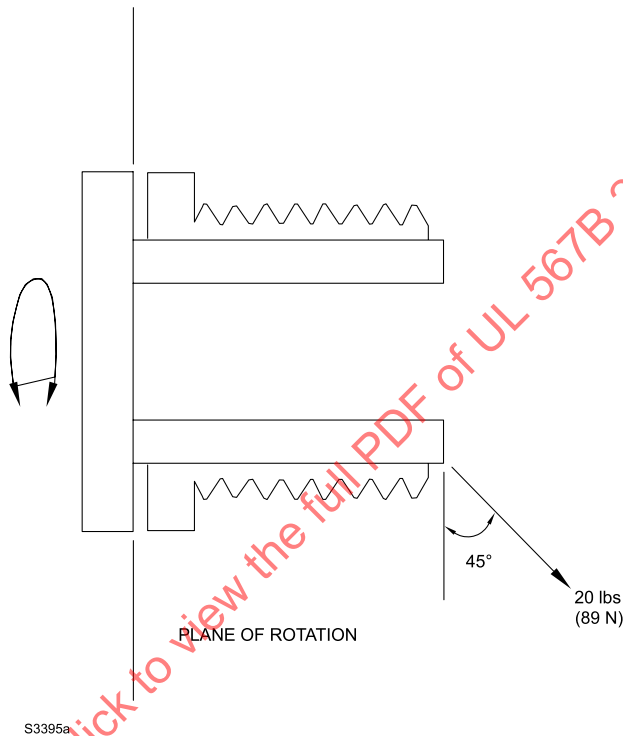


Figure 16.2
Alternate Application of Test Force for Axial Swivel

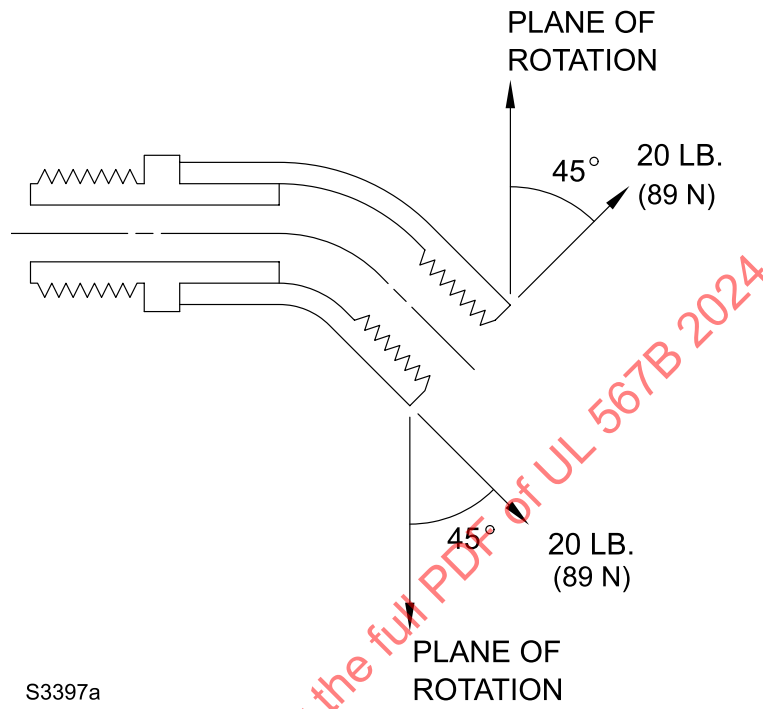


Figure 16.3
Application of Test Force for Compound Swivel

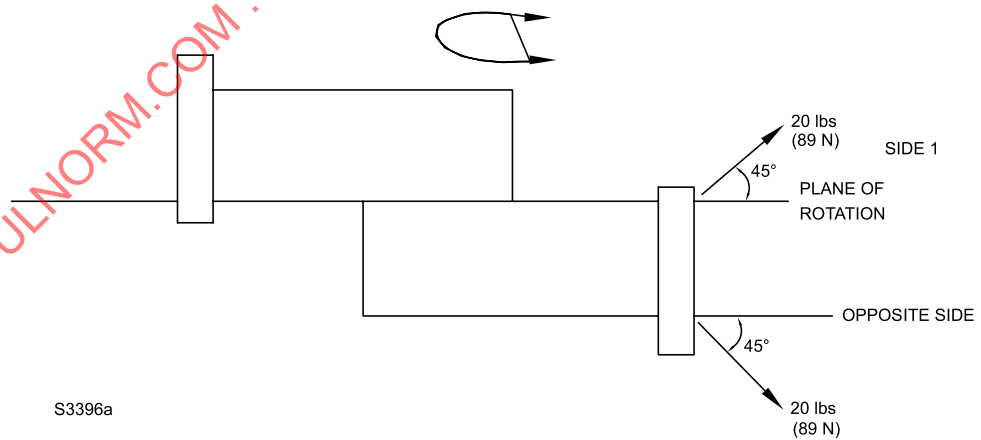
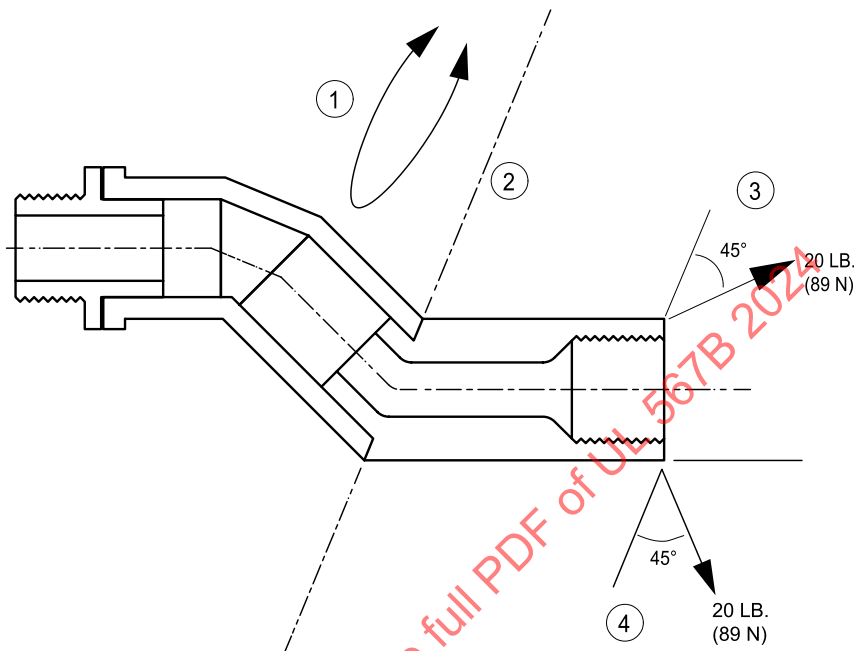


Figure 16.4
Application of Test Force on Compound Swivel with 45° Outlet



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- 1 – Direction of Rotation
- 2 – Plane of Rotation
- 3 – Side One – fixed line is parallel to plane of rotation.
- 4 – Opposite Side – fixed line is parallel to plane of rotation.