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400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE STANDARD

AS 1730

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Revised

# COUPLING, FUEL, RIGID, THREADED TYPE



## 1. SCOPE

This specification defines the requirements for a threaded rigid coupling assembly, which utilizes ferrule type machined tube end fittings, to join tubing and components in aircraft fuel, vent and other systems. This coupling assembly is designed for use from -65 to 200 deg. F and at 125 psi operating pressure.

## 1.1 CLASSIFICATION

### 1.1.1 The Coupling Assemblies Shall be of the Following Types:

Type I - Without Wrenching Lugs
Type II - With Wrenching Lugs

## 2. APPLICABLE DOCUMENTS

The following documents of the issue in effect on date of invitation for bids or request for proposals, form a part of this specification to the extent specified herein.

## 2.1 SPECIFICATIONS

### 2.1.1 FEDERAL

| | |
|---|---|
| PPP-T-60 | Tape, Packaging, Waterproof |
| PPP-B-566 | Boxes, Folding Paperboard |
| PPP-B-576 | Box, Wood, Cleated, Veneer, Paper Overlaid |
| PPP-B-585 | Boxes, Wood, Wirebound |
| PPP-B-591 | Boxes, Shipping Fiberboard, Wood-Cleated |
| PPP-B-601 | Boxes, Wood, Cleated-Plywood |
| PPP-B-636 | Boxes, Shipping Fiberboard |
| PPP-B-665 | Boxes, Paperboard, Metal-Edged and Components |
| PPP-B-676 | Boxes, Set-Up |
| VV-P-236 | Petrolatum, Technical |
| WW-T-700/6 | Tube, Aluminum Alloy, Drawn, Seamless, 6061 |
| TT-S-735 | Standard Test Fluids; Hydrocarbon |

### 2.1.2 MILITARY

| | |
|---|---|
| MIL-P-116 | Preservation - Packaging, Methods of |
| MIL-B-5087 | Bonding, Electrical and Lightning Protection |
| MIL-S-7742 | Screw Threads, Standard, Optimum Selected Series: General Specification for |
| MIL-L-10547 | Liners, Case and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible |
| MIL-R-25988/1 | Rubber, Fluorosilicone Elastomer, Oil- and Fuel-Resistant, Sheets, Strips, Molded Parts, and Extruded Shapes |

## 2.2 STANDARDS

### 2.2.1 MILITARY

| | |
|---|---|
| MIL-STD-105 | Sampling Procedures and Tables for Inspection by Attributes |
| MIL-STD-129 | Marking for Shipment and Storage |
| MIL-STD-130 | Identification Marking of U.S. Military Property |
| MIL-STD-810 | Environmental Test Methods |
| MIL-STD-831 | Test Reports, Preparation of |
| MIL-STD-889 | Dissimilar Metals |

(Copies of documents required by suppliers in connection with specific procurement functions shall be obtained from the procuring activity or as directed by the Contracting Officer).

2.3 INDUSTRY - SOCIETY OF AUTOMOTIVE ENGINEERS

ARP 1185 Flexure Testing of Hydraulic Tubing Joints and Fittings

AS567 General Practices for Use of Lock Wire, Key Washers, and Cotter Pins

AS568 Aerospace Size Standard for O-rings

AS1055 Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings and Similar System Components

AS1731 Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends, Envelope Dimensions

AS1732 Body, Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends, Type I

AS1733 Body, Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends, Type II

AS1734 Nut, Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends, Type I

AS1735 Nut Assembly, Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends, Type II

AS1736 Washer, Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends

AS1737 Ferrule, Coupling, Rigid, Fixed Cavity, Threaded, Ferrule Type Tube Ends

(Application for Copies Should be Addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096)



3. REQUIREMENTS

3.1 QUALIFICATION

Coupling assemblies furnished under this specification shall be products which are qualified by meeting all of the requirements covered by this document. Manufacturers choosing to produce only a part or parts of the coupling assembly shall qualify the part or parts by complying with the requirements and performing all tests of this specification. The test specimens for qualification of a part or parts shall be completed with a qualified part or parts made by other manufacturers.

3.2 MATERIALS AND FINISHES

Materials and finishes for the components shall be those designated on standards and drawings. Alternate materials and substitutions shall be approved by the procuring activity. All materials and finishes shall be uniform in quality, free from defects suitable for the purpose intended and consistent with good manufacturing practices.

3.2.1 DISSIMILAR MATERIALS

Materials shall possess adequate corrosion-resistance characteristics or shall be suitably protected by the use of finishes to resist corrosion which may result from such conditions as dissimilar metal combinations, moisture, salt spray, and high-temperature deterioration. Dissimilar materials are defined by MIL-STD-889.

3.3 DESIGN AND CONSTRUCTION

The coupling assembly shall be a light weight rigid connection for fuel, vent and other system lines using the basic principles of O-ring sealing. It shall be designed for 125 PSIG operating pressure at temperatures from -65 to 200 deg. F. Types shall be in accordance with paragraph 1.1.1.

3.3.1 COUPLING COMPONENTS

The coupling assembly shall consist of the following components.

| TYPE I - WITHOUT WRENCHING LUGS | TYPE II - WITH WRENCHING LUGS |
|---|---|
| (1) Body - AS1732 [1] | (1) Body - AS1733 [1] |
| (1) Ferrule - AS1737 [1] | (1) Ferrule - AS1737 [1] |
| (1) Nut - AS1734 | (1) Nut - AS1735 |
| (1) Washer - AS1736 | (1) Washer - AS1736 |
| (1) O-ring Seal [2] | (1) O-ring Seal [2] |

[1] Component attached to tubing by roller swaging or bulge forming.

[2] Not part of assembly and supplied by user.

3.3.2 THREADS

Threads shall be in accordance with Federal Standard H28 and shall conform to MIL-S-7742 Class 2.

3.3.3 SEALS

O-rings are not considered a part of this specification except for coupling qualification test requirements. O-ring sizes for the couplings are given in Table I.

TABLE I

PHYSICAL REQUIREMENTS

| COUPLING SIZE (REF.) | TUBE SIZE (REF.) IN. | OPERATING PRESSURE | | PROOF PRESSURE | | BURST PRESSURE (MINIMUM) PSIG | AS568 O-RING DASH NO. (REF.) |
|---|---|---|---|---|---|---|---|
| | | NEGATIVE IN. HG. | POSITIVE PSIG | NEGATIVE IN. HG. | POSITIVE PSIG | | |
| 04 | .250 | 24 | 125 | 28 | 250 | 375 | -012 |
| 05 | .312 | 24 | 125 | 28 | 250 | 375 | -013 |
| 06 | .375 | 24 | 125 | 28 | 250 | 375 | -014 |
| 08 | .500 | 24 | 125 | 28 | 250 | 375 | -016 |
| 10 | .625 | 24 | 125 | 28 | 250 | 375 | -018 |
| 12 | .750 | 24 | 125 | 28 | 250 | 375 | -020 |
| 14 | .875 | 24 | 125 | 28 | 250 | 375 | -022 |
| 16 | 1.000 | 24 | 125 | 28 | 250 | 375 | -024 |
| 20 | 1.250 | 24 | 125 | 28 | 250 | 375 | -028 |
| 24 | 1.500 | 24 | 125 | 28 | 250 | 375 | -030 |
| 28 | 1.750 | 24 | 125 | 28 | 250 | 375 | -032 |
| 32 | 2.000 | 24 | 125 | 28 | 250 | 375 | -034 |
| 36 | 2.250 | 10 | 125 | 12 | 250 | 375 | -036 |
| 40 | 2.500 | 10 | 125 | 12 | 250 | 375 | -038 |
| 48 | 3.000 | 10 | 125 | 12 | 250 | 375 | -042 |
| 56 | 3.500 | 10 | 125 | 12 | 250 | 375 | -044 |
| 64 | 4.000 | 10 | 125 | 12 | 250 | 375 | -046 |
| 72 | 4.500 | 10 | 125 | 12 | 250 | 375 | -048 |
| 80 | 5.000 | 10 | 125 | 12 | 250 | 375 | -050 |
| 88 | 5.500 | 10 | 125 | 12 | 250 | 375 | -162 |

3.4 DIMENSIONS

The coupling assembly envelope dimensions shall be as specified in AS1731. Part dimensions shall be as specified in applicable part standards.

3.4.1 COUPLING WEIGHT

The coupling assembly and components shall not exceed the maximum weights listed on the applicable standard or drawing.

3.5 PERFORMANCE

The coupling assembly shall meet the following performance requirements.

3.5.1 PROOF PRESSURE

The coupling assembly shall meet the negative and positive proof pressures listed in Table I. A decrease in negative pressure exceeding 1/2 inch Hg within five minutes, leakage sufficient to form a drop when pressurized for a minimum of thirty seconds and a maximum of five minutes or evidence of any other malfunction shall be cause for rejection. Testing is specified in Paragraph 4.6.2.

3.5.2 REPEATED ASSEMBLY

The coupling assemblies shall show no evidence of permanent deformation, damage or material degradation and shall withstand without evidence of leaking (sufficient to form a drop) the proof pressure requirements of Paragraph 3.5.1 after 100 repeated assembly operations. Testing is specified in Paragraph 4.6.3.

3.5.3 SALT FOG

The coupling assembly shall show no evidence of excessive corrosion, peeling, chipping or blistering of the finish or exposure of base metal and shall meet the electrical resistance requirement of Paragraph 3.5.6 and the proof pressure requirements of Paragraph 3.5.1 after being exposed to salt fog for 168 hours. Test method is specified in Paragraph 4.6.4.

3.5.4 FLEXURE

The coupling assembly shall meet the electrical resistance requirement of Paragraph 3.5.6 and proof pressure requirements of Paragraph 3.5.1 after being subjected to 10,000,000 planar or rotary flexure cycles. Half of the flexure cycles shall be conducted at room temperature. The remaining flexure cycles shall be equally divided between flexure test at 200 deg. F and -65 deg. F. Specimen lengths and deflections shall be in accordance with Tables II and III. Testing is specified in Paragraph 4.6.5.

3.5.5 BURST

The coupling assembly shall not rupture nor show evidence of leakage (sufficient to form a drop) at any pressure up to the Table I burst pressures. Testing is specified in Paragraph 4.6.6.

3.5.6 ELECTRICAL BONDING

The electrical resistance of the coupling when measured from tube to tube shall not exceed 1.0 ohm at any time. Testing is specified in Paragraph 4.6.7.

3.6 IDENTIFICATION OF PRODUCT

Coupling assemblies and parts shall be marked for identification in accordance with the applicable standard or drawing and with applicable parts of MIL-STD-130.

3.7 WORKMANSHIP

Coupling components shall be manufactured and finished in accordance with commercially accepted practices and processes.

3.8 CLEANING

The coupling assemblies as supplied shall be free of oil, grease, dirt or any other foreign material both internally and externally.

4. QUALITY ASSURANCE PROVISIONS

4.1 RESPONSIBILITY FOR INSPECTION

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection and test requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the procuring activity for the performance of the inspection and test requirements. The procuring activity reserves the right to perform any of the inspections and tests set forth in the specification, where such inspections and tests are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.2 CLASSIFICATION OF INSPECTIONS

The examining and testing of assemblies shall be classified as:

a. Qualification inspections (see 4.3).

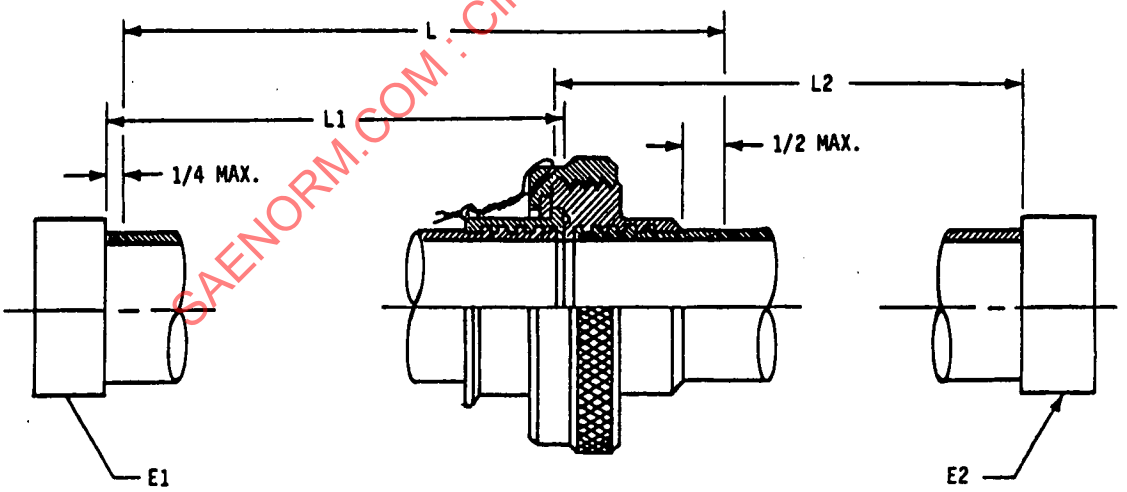
b. Quality conformance inspections (see 4.4).

4.3 QUALIFICATION INSPECTIONS

4.3.1 QUALIFICATION TEST SPECIMENS

Test specimens shall be in accordance with Figure 1 and Table II. The number of specimens are specified in paragraph 4.3.2. Tubing for fabrication of the test specimens shall be 6061-T4 in accordance with WW-T-700/6 with wall thickness as shown in Table III. Attachment of ferrule and body to tubing shall be in accordance with procuring activity specifications.






TEST SPECIMEN CONFIGURATION

Figure 1

TABLE II

TEST SPECIMEN LENGTHS AND END FITTING CONFIGURATIONS

| TUBE SIZE | SPECIMENS 1 & 2 - IN. | | | | SPECIMENS 3 & 4 (2) - IN. | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | E1 | L1 | L2 | E2 | E1 | L (1) (REF) | L1 | L2 | E2 |
| 06 | | 6 | 6 | | | 7.8 | 8.7 | 9 | |
| 12 | | 6 | 6 | | | 11 | 11.9 | 9 | |
| 16 | (2) | 6 | 6 | (2) | (2) | 12.8 | 13.7 | 9 | (2) |
| 32 | | 9 | 9 | | | 18 | 18.9 | 9 | |
| 48 | | 9 | 9 | | | 21.1 | 22.0 | 9 | |
| 64 | | 12 | 12 | | | 25.5 | 26.4 | 9 | |
| 80 | | 12 | 12 | | | 28.5 | 29.5 | 9 | |

(1) "L" LENGTHS ARE SPECIFIED IN TABLE III
(See figure 2 for flexure test schematic)

(2) Configuration of specimen ends shall be compatible with test requirements and shall be determined by test laboratory or coupling manufacturer.



TABLE III

TUBE DIMENSIONS, ASSEMBLY TORQUE AND FLEXURE TEST REQUIREMENTS

| COUPLING SIZE (REF) | TUBE DIA (3) IN. | TUBE WALL THICKNESS (4) IN. | TYPE II COUPLING TORQUE IN. LBS | FLEXURE TEST REQUIREMENTS | | |
|---|---|---|---|---|---|---|
| | | | | SPECIMEN LENGTH L - IN. | DEFLECTION D - IN. | BENDING MOMENT, IN. LBS (5) |
| 04 | .250 | .028 | 20-30 | 6.3 | .097 | 8.7 |
| 05 | .312 | .028 | 25-35 | 7.1 | .096 | 14.4 |
| 06 | .375 | .028 | 30-40 | 7.8 | .095 | 21.5 |
| 08 | .500 | .028 | 40-50 | 9 | .094 | 39.8 |
| 10 | .625 | .028 | 50-65 | 10 | .092 | 63.3 |
| 12 | .750 | .028 | 60-84 | 11 | .091 | 91.6 |
| 14 | .875 | .035 | 70-95 | 11.9 | .092 | 155.7 |
| 16 | 1.000 | .035 | 84-120 | 12.7 | .090 | 203.7 |
| 20 | 1.250 | .035 | 120-156 | 14.2 | .088 | 316.2 |
| 24 | 1.500 | .049 | 180-216 | 15.5 | .090 | 641 |
| 28 | 1.750 | .049 | 204-240 | 16.8 | .088 | 868 |
| 32 | 2.000 | .049 | 240-276 | 18 | .086 | 1123 |
| 36 | 2.250 | .058 | 264-300 | 19 | .087 | 1689 |
| 40 | 2.500 | .058 | 288-324 | 20.1 | .085 | 2066 |
| 48 | 3.000 | .058 | 360-396 | 22 | .082 | 2905 |
| 56 | 3.500 | .058 | 432-468 | 23.7 | .079 | 3944 |
| 64 | 4.000 | .065 | 504-540 | 25.4 | .079 | 5603 |
| 72 | 4.500 | .065 | 576-612 | 26.9 | .076 | 6893 |
| 80 | 5.000 | .065 | 648-684 | 28.4 | .074 | 8251 |
| 88 | 5.500 | .065 | 720-756 | 29.8 | .071 | 9661 |

(3) All sizes listed are not required for qualification testing but are included in the event that the procuring activity specifies additional testing.

(4) Aluminum drawn tubing, 6061-T4 in accordance with WW-T-700/6

(5) Based on tube stress of 9,125 psi (yield strength corrected for elevated temperature, swaging stress factor and endurance limit).

4.3.2 TEST SCHEDULE AND SEQUENCE

Four test specimens for each of the coupling sizes 06, 12, 16, 32, 48, 64 and 80 shall be subjected to qualification tests in the order indicated in Table IV. The type coupling assembly to be qualified shall be specified by the procuring activity. MIL-R-25988/1 O-rings shall be used for qualification testing.

TABLE IV

TEST SCHEDULE AND SEQUENCE

| SPECIMEN NUMBERS | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| PARAGRAPHS | 4.6.1 | 4.6.1 | 4.6.1 | 4.6.1 |
| | 4.6.7 | 4.6.7 | 4.6.7 | 4.6.7 |
| | 4.6.2 | 4.6.2 | 4.6.2 | 4.6.2 |
| | 4.6.3 | 4.6.3 | 4.6.5 | 4.6.5 |
| | 4.6.4 | 4.6.4 | 4.6.2 | 4.6.2 |
| | 4.6.2 | 4.6.2 | 4.6.7 | 4.6.7 |
| | 4.6.7 | 4.6.7 | 4.6.6 | |
| | 4.6.6 | | | |

4.3.3 TEST REPORT, TEST SAMPLES AND DATA FOR THE PROCURING ACTIVITY

When the tests are conducted at a location other than the laboratory of the procuring activity, the following shall be furnished to that activity:

a. Test Report

Three (3) copies of a test report in accordance with MIL-STD-831, which shall include a report of all tests and outline description of the tests and conditions. (See note below)

b. Test Samples

Test samples when requested by the procuring activity. Samples subjected to qualification testing shall not be shipped as part of contract or order.

c. Drawings

Three (3) sets of assembly and subassembly drawings. The assembly drawings shall have a cut-away section showing all details in their normal assembly position and shall carry part numbers of all details and subassemblies.

Note: Log sheets and recorded test data shall remain on file at the source test facility and are not to be sent to the procuring activity unless specifically requested.

4.3.4 QUALIFICATION INSPECTION METHODS

Qualification inspection methods shall consist of all the examinations and tests specified under 4.6.

4.4 QUALITY CONFORMANCE INSPECTIONS

Quality conformance inspections shall be in accordance with MIL-STD-105 and Paragraphs 4.4.1 and 4.4.2. Each coupling part shall be subjected to examination of product as specified in 4.6.1. Any coupling part failing to pass the examination shall be rejected.

4.4.1 SAMPLE SIZE AND DISTRIBUTION

The classes, AQL's and defect characteristics referred to in MIL-STD-105 are further defined in Table V. Sample size shall be as specified in Table VI and shall be in accordance with MIL-STD-105.

TABLE V

DEFECT CHARACTERISTICS

| CLASS | AQL | CHARACTERISTIC |
|---|---|---|
| MAJOR | 1.0% | LIKELY TO CAUSE MALFUNCTION, OR REDUCING USABILITY OF THE PART |
| MINOR A | 4.0% | MAY HAVE A SLIGHT EFFECT ON USABILITY |
| MINOR B | 6.5% | ESSENTIALLY NO EFFECT ON USABILITY |

4.4.2 CLASSIFICATION OF DEFECTS

TABLE VI

CLASSIFICATION OF DEFECTS

| PART | CLASS | CHARACTERISTIC 1 |
|---|---|---|
| BODY AS1732 AS1733 | MAJOR 1.0% AQL | B,H,K,S,T |
| | MINOR A 4.0%AQL | D,M,W,X |
| | MINOR B 6.5% AQL | REMAINDER |
| NUT ASSEMBLY AS1734 AS1735 | MAJOR 1.0% AQL | D,T |
| | MINOR A 4.0% AQL | C |
| | MINOR B 6.5% AQL | REMAINDER |
| WASHER AS1736 | MAJOR 1.0% AQL | C |
| | MINOR A 4.0% AQL | A |
| | MINOR B 6.5% AQL | B |
| FERRULE AS1737 | MAJOR 1.0% AQL | E,K |
| | MINOR A 4.0% AQL | A |
| | MINOR B 6.5% AQL | REMAINDER |

1 See applicable standard page for dimension.



4.4.3 REJECTION AND RETEST

Where one or more items selected from a lot fails to meet the specification, all items in the lot shall be inspected.

4.4.3.1 Resubmitted Lots

Once a lot (or part of a lot) has been rejected by a procuring activity (Government or industry), before it can be resubmitted for tests, full particulars concerning the cause of the rejection and the action taken to correct the defect(s) in the lot shall be submitted, in writing, to the procuring activity.

4.5 TEST CONDITIONS

4.5.1 ASSEMBLY OF TEST SPECIMENS

Type I coupling assemblies shall be hand tight and Type II coupling assemblies shall be tightened to applicable torque values tabulated in Table III. Lockwire all coupling assemblies in accordance with AS567. O-ring and threads shall be lubricated with VV-P-236 petrolatum.

4.5.2 TEST FLUIDS

Test fluids shall be in accordance with TT-S-735, Type I for -65 deg. F tests and Type III for room and 200 deg. F tests, or as specified. Optional test fluids may be approved by the procuring activity.

4.5.3 PRESSURE MEASUREMENTS

Unless otherwise specified, positive pressure measurements shall have a tolerance of +/-10 psi. Negative pressures shall be equal to or greater than specified value.

4.5.4 TEMPERATURE MEASUREMENTS

Unless otherwise specified, the test specimens and fluid shall be maintained within +/-5 deg. F. Ambient temperature measurements shall be taken within six inches of the specimen.

4.5.5 TEST SETUP

Test setups shall be in accordance with Figures 2 and 3, page 12. Deviations from these setups shall be approved by the procuring activity.

4.6 INSPECTION METHODS

4.6.1 EXAMINATION OF PRODUCT

Each assembly or part shall be visually and dimensionally inspected to determine compliance with the applicable standard or drawing with respect to material, size, workmanship and AQL level specified in Table VI. Inspection reports shall be provided if requested by the procuring activity.

4.6.2 PROOF PRESSURE TEST

Test specimens shall be subjected to the Table I positive and negative proof pressure as specified or in conjunction with other tests.

4.6.2.1 Negative Proof Pressure Test

Test specimens shall be dry and free of fuel or test fluid vapors. The connection between the test specimen and vacuum pump shall be 1/2 inch nominal hose or tube size minimum and shall not exceed a length of 10 feet. Pressure shall be measured within six inches of the test specimen. A stop valve shall be installed adjacent to the pressure gage in the line to the pump. A negative proof pressure equal to or greater than the Table I specified pressure shall be maintained for a minimum of 15 minutes. The stop valve shall then be closed and the pressure shall be monitored for five minutes for evidence of leakage. The test specimen shall meet the requirements of Paragraph 3.5.1.

4.6.2.2 Positive Proof Pressure Test

The test specimens shall be proof pressure tested to the Table I positive value for not less than 30 seconds and not more than five minutes. The test fluid shall be as specified in other tests or may be water. The test specimen shall be monitored for leakage and shall meet the requirements of Paragraph 3.5.1.

4.6.3 REPEATED ASSEMBLY TEST

Test specimens 1 and 2, as specified in Figure 1 and Table II, shall be assembled and disassembled on hundred times each. Lubricate O-ring seal, threads and the AS1736 washer with a light coat of VV-P-236 petrolatum during each assembly operation. Hand tighten the Type I coupling assemblies and torque the Type II coupling assemblies to the applicable torque value specified in Table III. On each disassembly operation, remove the AS 1736 washer from around the ferrule. After completion of the repeated assembly operations, proof pressure test the assemblies in accordance with Paragraph 3.5.1. Monitor test specimens for leakage during the proof pressure test. Specimens shall meet the requirements of Paragraph 3.5.2.

4.6.4 SALT FOG TEST

Test specimens 1 and 2 as specified in Figure 1 and Table II shall be mounted in a suitable chamber and exposed to salt fog for 168 hours in accordance with MIL-STD-810, Method 509.1. After the 168 hours of exposure, examine the test specimens for evidence of excessive corrosion, peeling, chipping or blistering of the finish or exposure of base metal. Air dry the assemblies and measure the electrical resistance across the coupling assemblies in accordance with Paragraph 4.6.7. Perform proof pressure test in accordance with Paragraph 4.6.2. The test specimen shall be monitored for leakage during the proof pressure test and shall meet the requirements of Paragraph 3.5.3.