

NATIONAL AIRCRAFT STANDARDS COMMITTEE

AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA, INC., 610 SHOREHAM BUILDING, WASHINGTON 5, D. C.

SPECIFICATION - COUPLING; FLEXIBLE, FUEL

FOR ONE INCH THROUGH FOUR INCH TUBE SIZES

A. SCOPE AND CLASSIFICATION

A-1. Scope - This specification is drawn to present design requirements and a standard method for testing flexible tube couplings for fuel systems.

A-2. Classification - This specification covers all types of fuel system flexible couplings, in tube O.D., sized 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 3 1/2, 4 inch. The data obtained from tests of these couplings shall be recorded to provide uniform test reports on all couplings. The test reports will aid in the evaluation of the performance of these couplings for use in military aircraft.

B. APPLICABLE SPECIFICATIONS AND DRAWINGS

The following publications of the issue in effect on date of test shall form a part of this specification to the extent applicable.

B-1. Specifications

Federal

QQ-A-354 - Aluminum Alloy (AL-24), Bars, Rods, Shapes and Wire.
 QQ-A-367 - Aluminum Alloy Forgings, Heat Treated.
 QQ-S-633 - Steel, Carbon, Bars.
 QQ-P-416 - Plating, Cadmium, Electrodeposited.
 WW-T-787 - Tubing, Aluminum Alloy (AL-52) Round Seamless

Military

MIL-H-3136 - Hydrocarbon - Fluid Standard Test
 MIL-H-6088 - Heat Treatment of Aluminum Alloys; Process for, (For Aircraft Application).
 MIL-S-7742 - Screw Threads, Standard Aeronautical.
 MIL-F-5572 - Fuel, Aircraft Reciprocating Engine.
 MIL-F-5624 - Fuel, Aircraft Turbine and Jet Engines, Grades JP3 and JP4.
 MIL-F-7179 - Finishes and Coatings; General Specification for Protection of Aircraft and Parts.
 MIL-O-6081 - Oil, Lubricating, Jet Engine.
 MIL-E-5272 - Environmental Testing, Aeronautical and Associated Equipment, General Specification for.
 MIL-P-5315 - Packing "O" Ring Hydrocarbon Fuel Resistant.
 MIL-R-6855 - Rubber; Synthetic, Sheet, Molded and Extruded for Aircraft Application.

Air Force-Navy Aeronautical

AN-QQ-A-696 - Anodic Films; Corrosion Protective for Aluminum Alloys.

B-1a. Other Publications

MCREXP-524-1854 - Air Materiel Command Memorandum Report, General Requirements for Fuel System Components.
 TN-TSESE-1 - Design of Aircraft and Aeronautical Equipment for Operation in Extreme Climatic Conditions.

B-2. Drawings

The following drawings, of the issue in effect on date of test, shall form a part of this specification to the extent specified herein.

Air Force-Navy Aeronautical Standard Drawings

AND10060 - Tubing End, Hose Connection, (Standard Dimensions For).
 AND10058 - Fitting End, Hose Connection, (Standard Dimensions For).
 AND10398 - Metals - Definition of Dissimilar.
 AND10106 - Tubing - Standard Sizes for Aluminum Alloy (52S-0) Round.

Air Force Standard Drawing

50A9125 - U. S. Air Force Drawing, "Plate - Rubber Parts Curing Date, Fuel System."
 934 - Packing - O-Ring, Gasoline or Kerosene Resistant.

ALL SHEETS INACTIVE FOR DESIGN AFTER
 1 DECEMBER 1962. SEE MIL-C-25014.
 FOR DEFINITION OF DRAWING STATUS NOTE

SEE NAS380

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C. REQUIREMENTS

C-1. Material - Metallic parts shall be fabricated from material conforming to any of the specifications listed in Section B or to applicable military specifications.

C-2. Heat Treatment - Aluminum alloy parts shall be heat treated in accordance with Specification MIL-H-6088.

C-3. Finish - All aluminum alloy parts shall be anodically treated in accordance with Specification AN-QQ-A-696. Carbon steel parts shall be cadmium plated in accordance with QQ-P-416, Type II, Class C.

C-4. Identification of Product - All couplings shall be permanently marked with the manufacturer's name or trademark, part number per reference Specification AN-M-13a and shall be coded for tube size.

C-5. Design and Performance

C-5a. Threads - All threads, where used, shall conform to Specification MIL-S-7742.

C-5b. Misalignment

C-5b-1. Angular Misalignment - The coupling shall provide for a maximum installation misalignment of 3° in any direction between tube centerlines.

C-5b-2. Axial Offset - The coupling shall provide for an offset of 1/16" between tube centerlines, but need not provide for any simultaneous angular misalignment.

C-5b-3. Flexure - The coupling shall provide for a 30 minute flexure in any direction from any installed position.

C-5c. Pressure and Temperature

C-5c-1. Liquids

- a. Temperature range -65°F to +158°F
- b. Pressure

Working	125 psi
Proof	250 psi
Burst	375 psi
Negative	22 in. Hg

C-5c-2. Vapors

- a. Temperature range -65°F to +225°F
- b. Pressure

Working	15 psi
Proof	30 psi
Burst	45 psi
Negative	10 in. Hg

C-5d. Tube End - Preferably on existing AN standard.

C-5e. Tube Gap

C-5e-1. Nominal Gap - The nominal design distance between tube ends shall be kept to a minimum.

C-5e-2. Tube Gap Variation - The coupling shall provide for 3/16" variation in gap.

C-5e-3. Tube Gap Axial Movement - The coupling must allow a minimum of 1/32" axial movement in either direction from the installed position.

C-5f. Torque

C-5f-1. The torque required to tighten the fitting shall not exceed 250 in. lbs.

C-5f-2. Must use standard tools.

C-5g. Restraint - The coupling shall be capable of operating with all combinations of restraint from full restraint to no restraint.

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C-5h. Wall Thickness - The coupling shall be capable of joining tubing having the minimum thickness permitted by proof and burst pressure (but in no case lighter than .032" wall).

C-5i. Seal Member

C-5i-1. Preferably an existing AN standard.

C-5i-2. Shall be readily replaceable without special tools and with as little disturbance of the installation as possible without damage to the coupling or tube.

C-5i-3. Shall not be required to resist end load of tube under pressure.

C-5j. Method of Sealing - Shall seal like an "O" ring i.e. independent of torque (Can provide take-up like a packing gland providing take-up cannot damage seal.)

C-5k. Local Assembly - Preferably allow assembly of the coupling parts on the tubes after the tubes have been inserted through airplane structural apertures as close to the tube diameter as possible.

C-5l. Envelope Size - Diameter, assembly length and installed length should be held to a minimum.

C-5m. Pressure Drop - Shall be held to a minimum.

C-5n. Repeated Assembly - The coupling shall withstand 50 repeated assemblies without damage to coupling parts or tube ends, but with the provision that the seals may be replaced if necessary.

D. SAMPLING, INSPECTION AND TEST PROCEDURE

D-1. Classification of Tests - This specification covers only qualification test of couplings.

D-1a. Qualification Tests - Qualification tests are those accomplished on samples submitted for qualification as satisfactory products.

D-2. Qualification Tests

D-2a. Sampling Instructions - Qualification test samples shall consist of six flexible couplings of each size on which qualification is desired. Samples shall be plainly identified by securely attached durable tags marked with the following information:

Sample for Qualification Test, Specification

Fitting, Tube, Fuel System

Name of Manufacturer

Manufacturer's Part Number

Submitted by (Name) (Date) (for Qualification Test in accordance with reference Contractors' Authorization letter).

D-2b. Tests - Qualification tests of fittings shall consist of all and only the tests outlined under Section D of this specification.

D-3. Test Methods

D-3a. Examination of Product - Each fitting shall be examined carefully to determine conformance with this specification with respect to materials, workmanship, marking and for conformance with the manufacturers' drawings.

D-3b. Pressure and temperature test conditions for liquid fuel transfer and fuel vapor transfer are as follows:

D-3b-1. Liquids

- a. Temperature range -65°F to +158°F
- b. Pressure

Working	125 psig
Proof	250 psig
Burst	375 psig
Negative	22 in. Hg

D-3b-2. Vapors

- a. Temperature range -65°F to +225°F
- b. Pressure

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