

MIL-C-85061B
 1 April 1982
 SUPERSEDING
 MIL-C-85061A
 9 June 1980

MILITARY SPECIFICATION

COUPLING, FUEL LINE, FLEXIBLE, 125 PSI

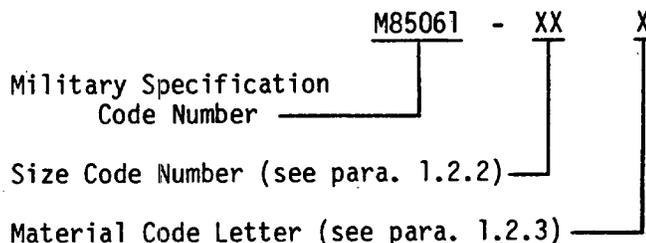
This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers flexible couplings for joining tubing with MS33660 Type A beaded ends (see 6.1).

1.2 Classification.

1.2.1 Coupling designation. Couplings covered by this specification shall be designated in the following form (see 6.2.1 and 6.3.3):



1.2.2 Size. The size of the coupling is identified by the two digit dash number (see Table II) for the outside diameter (O.D.) of the tube used with the coupling.

1.2.3 Material. The basic material of the coupling is designated by a single letter (see Table I).

TABLE I. Coupling material.

Code	Material
A	Aluminum (Class A)
B	Stainless Steel (Class B)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

TT-S-735 Standard Test Fluids, Hydrocarbon

MILITARY

MIL-P-775 Packaging of Hose, Hose Assemblies, Rubber, Plastic, Fabric, or Metal (Including Tubing); and Fittings, Nozzles, and Strainers

DoD-D-1000 Drawings, Engineering and Associated Data

MIL-P-5315 Packing, Preformed, Hydrocarbon Fuel Resistant

MIL-T-5624 Turbine Fuel, Aviation Grades JP-4 and JP-5

MIL-A-8625 Anodic Coatings, for Aluminum and Aluminum Alloys

MIL-S-8879 Screw Threads, Controlled Radius Root with Increased Minor Diameter, General Specification for

STANDARDS

MILITARY

MIL-STD-130 Identification Marking of US Military Property

MIL-STD-143 Specifications and Standards, Order of Precedence for the Selection of

MIL-STD-889 Metals, Definition of Dissimilar

MS29512 Packing, Preformed; Hydrocarbon Fuel Resistant, Tube Fitting, "O"-Ring

MS29513 Packing, Preformed, Hydrocarbon Fuel Resistant, "O"-Ring

MS33660 Tubing End, Hose Connection, Standard Dimensions for

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AIR FORCE - NAVY AERONAUTICAL

AND10104 Tubing, Steel, Corrosion Resistant, Round, Standard
Dimensions for

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.1.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 First article. Unless otherwise specified, the contractor shall furnish sample couplings for inspection and approval in accordance with the first article requirements specified herein (see 4.3). The Contracting Officer reserves the right to waive first article inspection if deemed appropriate by the circumstances of a particular coupling procurement (see 6.2.1.c).

3.2 Selection of specifications and standards. Specifications and standards for all materials, parts, and Government certification and approval of processes and equipment, which are specifically designated herein and which are necessary for the execution of this specification shall be selected in accordance with MIL-STD-143.

3.3 Materials. Materials shall conform to applicable specifications and shall be as specified herein. Materials which are not covered by applicable specifications, or which are not specifically described herein, shall be suitable for the purpose intended and of the lightest practicable weight. All materials shall be resistant to fluids conforming to TT-S-735 and MIL-T-5624 to assure satisfactory operation.

3.3.1 Metals. Metals shall be of corrosion-resisting type to resist corrosion when exposed to climatic and environmental conditions encountered during the service life of the equipment. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

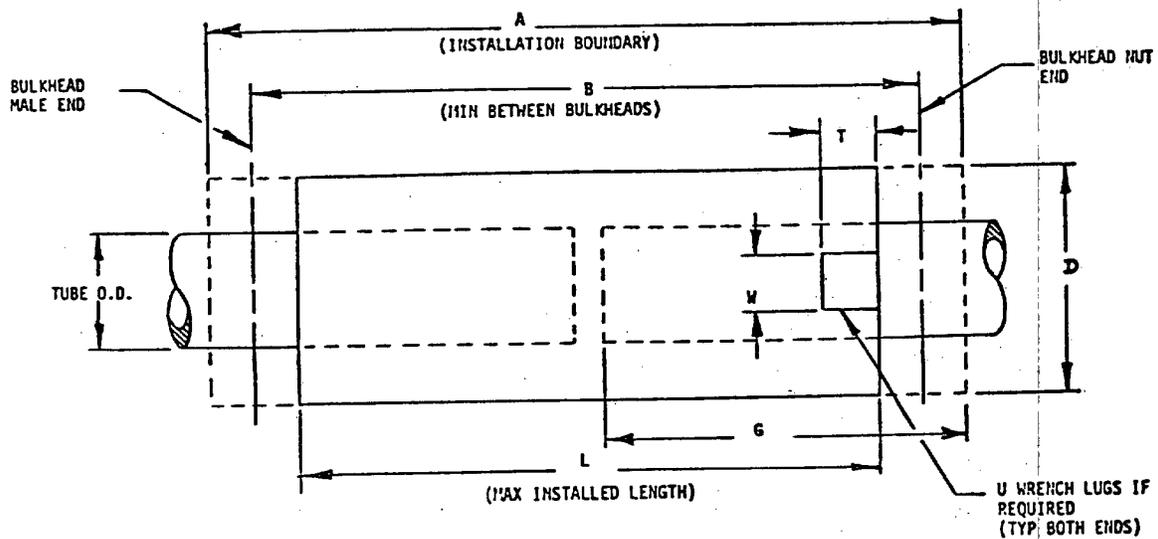
3.3.2 Aluminum alloy parts. All aluminum alloy parts shall be anodized in accordance with MIL-A-8625.

3.3.3 Steel parts. All steel parts shall be made of stainless steel.

3.3.4 Fungus-proof materials. Materials which are not nutrients for fungi shall be used to the greatest extent practicable. In cases where materials that are nutrients for fungi must be used, such materials shall be treated with fungicidal agent as approved by the procuring activity.

3.3.5 Dissimilar metals. Combinations of tubing and all contacting coupling parts shall be compatible in accordance with MIL-STD-889.

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FIGURE 1. Wrenching features.TABLE II. Dimensions.

DASH NO.	FOR O.D. TUBE (INCH)	A	B (MIN)	D (MAX)	G MIN. INSTAL. CLEAR.	L (MAX)	U (NO.)	REQUIRED SEAL SIZE MS29513 (REF.)	ALUM WEIGHT LBS (MAX)	STEEL WEIGHT LBS (MAX)	W (MIN)	T ±.010
-04	.250	3.39	1.81	.89	1.220	1.762	-	-010	.030	.106	-	-
-06	.375	3.61	2.62	1.10	1.289	1.954	4	-110	.038	.114	.187	.135
-08	.500	3.61	2.62	1.23	1.291	1.954		-112	.046	.138		
-10	.625	3.61	2.62	1.36	1.291	1.954		-114	.056	.168		
-12	.750	3.84	2.62	1.48	1.30	2.23		-210	.092	.265		
-16	1.00	4.01	2.84	1.73	1.43	2.35	8	-214	.130	.320	.250	.145
-20	1.25			1.98				-218	.142	.334		
-24	1.50	4.50	3.13	2.47	1.58	2.60		-325	.242	.550		
-28	1.75			2.72				-327	.255	.720		
-32	2.00			2.97				-329	.294	.741		
-40	2.50			3.47				-333	.350	1.051		
-48	3.00	3.97	-337	.438	1.310	12	-341	.563	1.780	.160		
-56	3.50	4.61	3.19	4.60	1.71		2.65	-345	.781		2.030	
-64	4.00			5.10		-349		.875	2.680			
-72	4.50	4.74	5.66	1.71	1.80	2.93	16	-429	1.140	3.200	.175	
-80	5.00	5.27	3.47	6.16				2.93	-433	1.268		3.380
-88	5.50			6.68				2.93	-437	1.900		3.600
-96	6.00	5.98	3.70	7.23	1.92	3.16						

NOTE:

1. DIMENSIONS IN INCHES.

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3.4 Design. The coupling shall be designed to connect lengths of tubing which have MS33660 Type A beaded ends and shall meet the requirements of Figure 1 and Table II.

3.4.1 Threads. Screw threads shall conform to MIL-S-8879. All threaded parts shall be securely locked in such a manner as to prevent loosening under test conditions specified herein and under normal service usage. Provisions for safety wiring shall be provided. Wrenching features shall conform to Figure 1.

3.4.2 Angular misalignment. The coupling shall be capable of being installed with a maximum tubing installation misalignment of 3 degrees in any direction.

3.4.3 Flexure. The coupling shall provide for 1 degree flexure in any direction from any installed position. The coupling shall provide for a variation in space between tubing ends of 0.062 to 0.188 inch.

3.4.4 Permanent deformation. Installation of the coupling on tubing ends under conditions specified herein shall not produce a permanent deformation of the coupling.

3.4.5 Tubing. The couplings shall be capable of joining tubing in accordance with dimensions shown on AND10104 for steel tubing, and in accordance with Table III for aluminum tubing.

TABLE III. Aluminum tube size and wall thickness.

Tube O.D. (inches)	Nominal Wall Thickness (Minimum) (inches)
1/4	.028
3/8	.028
1/2	.035
5/8	.035
3/4	.035
1	.035
1-1/4	.035
1-1/2	.035
1-3/4	.035
2	.035
2-1/2	.042
3	.042
3-1/2	.049
4	.049
4-1/2	.065
5	.065
5-1/2	.065
6	.065

3.5 Seal. The seal, which is used for testing purposes only and is not furnished as part of the flexible coupling, shall be in accordance with MIL-P-5315, MS29512, and MS29513 of the applicable size specified in Table II.

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3.6 Performance. The coupling, when installed in any position (attitude), shall meet all the performance requirements when tested in accordance with Section 4.

3.7 Interchangeability. All parts having the same manufacturer's part number shall be interchangeable. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of DoD-D-1000. Each lot shall be manufactured by the same manufacturer and have the same manufacturer's part number.

3.8 Identification marking of product. Assemblies shall be marked for identification in accordance with MIL-STD-130. In addition, the assembly shall have the following markings (see 6.3.3):

M85061-XXX

Torque _____ Pound-inches

3.9 Maintainability. Installed couplings shall not require maintenance. The seals shall be readily replaceable with no damage and a minimum of disturbance or displacement of the installed tubing or coupling.

3.10 Reliability. The quality of the coupling shall be such as to withstand the strains, jars, vibrations, and other conditions incident to aircraft installation and service usage.

3.11 Workmanship. The coupling shall be fabricated and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs, tool marks, and sharp edges.

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 requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure that the supplies and services conform to specified requirements.

4.2 Classification of inspection. The inspection and testing of couplings shall be classified as:

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

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4.3 First article inspection (see 6.2.1.c).

4.3.1 Sampling for first article inspection. Unless otherwise specified, two couplings of each procured size and class shall be subjected to the testing and inspection of paragraph 4.5 through 4.6.7 prior to the manufacturer starting production runs. These tests shall be conducted under the supervision of a Government inspector at the manufacturer's plant or commercial laboratory approved by the procuring activity. The couplings subjected to first article testing shall be discarded when these tests are completed. The manufacturer shall furnish two complete sets of detail and assembly drawings and two copies of the test report, signed by the Government inspector to the procuring activity.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of:

- a. Individual inspection (see 4.4.1)
- b. Sampling inspections (see 4.4.2)

4.4.1 Individual inspection. Each coupling shall be visually examined to insure that the coupling complies with the requirements specified in 4.6.1. Any coupling failing to pass the examination shall be rejected.

4.4.2 Sampling inspection. From each production run, one coupling shall be selected from each lot of 500 couplings or fraction thereof and subjected to the proof pressure test of 4.6.2. If this sample fails to pass this test, the lot represented by this sample shall be rejected. The tested coupling shall be discarded.

4.4.3 Rejection and retest. When one or more items from a lot fail the specified test, acceptance of all items in the lot shall be withheld until the extent and cause of failure are determined. When corrections have been made, all necessary tests shall be repeated.

4.5 Test conditions.

4.5.1 Pressure and temperature. The pressure and temperatures specified in Table IV shall apply to all tests required by this specification.

TABLE IV. Temperatures and pressures.

Fluid	Temp. (°F \pm 50°) Fluid and Ambient	Pressure (\pm 5 psi)		
		Operating	Proof	Burst
TT-S-735	-40 to +160	125	250	375

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4.5.2 Test assembly. Each assembly shall consist of 2 pieces of tubing in accordance with paragraph 3.4.5, Table III, approximately 12-3/4 inches long, with a MS33660 bead on one end of each tube. The tube assemblies shall be joined by the test article to make up the test specimen. Each assembly shall be closed on one end in order to accommodate paragraph 4.6.3, Fuel resistance test. Unless otherwise specified, "O"-ring seals shall conform to MIL-P-5315, MS29512 and MS29513. The coupling shall be torqued to the value recommended by the manufacturer and then safety wired. The coupling shall not be re-torqued after seal leakage occurs during testing. During the tests specified in paragraphs 4.6.2, 4.6.3.1, 4.6.3.2, 4.6.3.3, and 4.6.4 if seal leakage occurs, record the failure and the particular test when the leakage occurred, install new seal and continue testing.

4.5.3 Vibration test setup. The test assembly shall be mounted to a vibration table with an angular displacement of 3 degrees between tube centerlines. The distance between test assembly table supports, with the coupling located in the center of the assembly, shall be 20 inches for all sizes. The major axis of the test assembly shall be parallel to the vibration table and the direction of vibration shall be perpendicular to the vibration table. The vibration shall be 55 \pm 5 Hz with a double amplitude of 0.060 inches \pm 10 percent.

4.5.4 Tubing wall thickness. The tubing used in testing the coupling shall have wall thicknesses of the minimum standard values specified in AND10104 and Table III.

4.6 Inspection methods.

4.6.1 Examination of product. The coupling shall be examined to determine conformance to this specification with respect to all the requirements not covered by tests specified herein.

4.6.2 Proof pressure. The test assembly shall be subjected to a proof pressure test of 250 psig at +160°F for 5 minutes using TT-S-735, Type III test fluid. After completion of this test, drain the test assembly and refill with TT-S-735 Type I test fluid and repeat proof pressure tested at 250 psig at -40°F for a period of 5 minutes. Any leakage, rupture, permanent set, permanent deformation, or damage of any part of the test coupling shall be cause for rejection.

4.6.3 Fuel resistance test.

4.6.3.1 Phase I - High temperature fuel aging. TT-S-735 Type III test fluid shall be circulated for 72 hours while at +160°F and 125 psig. During the final 8 hours of this test, the assembly shall be vibrated in accordance with 4.5.3. Upon completion, and while still mounted in accordance with 4.5.3, the assembly shall be proof tested at 250 psig and +160°F with the pressure to be held for a minimum of 1 minute. There shall be no evidence of leakage (see 6.3.1) or deformation of the coupling.

4.6.3.2 Phase II - High temperature fuel aging. TT-S-735 Type I test fluid shall be circulated for 72 hours while at +160°F and 125 psig. During the final 8 hours of this test, the assembly shall be vibrated in accordance with 4.5.3. Upon completion, and while still mounted in accordance with 4.5.3, the assembly shall be proof tested at 250 psig and +160°F with the

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pressure to hold for a minimum of 1 minute. There shall be no evidence of leakage (see 6.3.1) or deformation of the coupling.

4.6.3.3 Low temperature fuel aging. TT-S-735 Type I test fluid shall be circulated for 72 hours while at 125 psig and -40°F. During the final 8 hours of this test, the assembly shall be vibrated in accordance with 4.5.3, the assembly shall be proof tested at 250 psig and at -40°F with the pressure to be held for a minimum of 1 minute. There shall be no evidence of leakage (see 6.3.1) or deformation of the coupling.

4.6.3.4 Air dry out. Upon completion of the low temperature test, the assembly shall be drained, cap removed, and the open test assembly placed in an air oven for 168 hours at +160°F. The low temperature test of 4.6.3.3 shall be repeated upon completion of the air dry out test.

4.6.4 Flexure. The tubing on one side of the coupling shall be rigidly fixed while the other tube shall be mounted eccentrically on a power driven spindle. The test setup shall provide 1/2 degree flexure in any direction with an initial 3 degrees misalignment between the centerlines.

Type I fluid shall be used at a pressure of 125 psig. The test fluid temperature shall be +160°F for the first 4 hour test period and -40°F during the second 4 hour period.

The test assembly shall be flexed for 8 hours at a minimum frequency of 60 cycles per minute.

At the conclusion of this test, a pressure test shall be conducted at the proof pressure of 250 psig and -40°F for 3 minutes. There shall be no evidence of leakage (see 6.3.1), rupture, permanent set, permanent deformation or damage of any part of the test coupling.

4.6.5 Disassembly and inspection. Upon completion of all tests, the tested couplings shall be disassembled and each part and tubing end examined. Any evidence of excessive wear (see 6.3.2) on the tubing or coupling parts, or permanent deformation or failure of any coupling part shall be cause for rejection.

4.6.6 Burst pressure. After completion of 4.6.5, coupling shall be re-assembled, a burst pressure test shall be conducted at the burst pressure of 375 psig and -40°F for a minimum of 3 minutes. There shall be no evidence of structural failure; i.e., cracks or ruptures, to any part of the test coupling.

4.6.7 Disassembly and inspection. Upon completion of the burst pressure test, the tested coupling shall be disassembled and each part and tubing end examined. Any evidence of cracks, ruptures, or any other structural deformation or failures of any coupling part, shall be cause for rejection.

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5. PACKAGING.

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-P-775.

6. NOTES.

6.1 Intended use. The flexible couplings covered by this specification are intended for connecting two MS33660 Type A beaded tube ends which are generally in aircraft fuel and vent systems.

6.2 Ordering data. Acquisition documents should specify the following:

6.2.1 Acquisition requirements.

- a. Title, number, and date of this specification.
- b. Military Specification Part Number required (see 6.3.3).
- c. Waiver of first article inspection, if deemed appropriate by the contracting officer (see 6.4).
- d. The reviewing and approval activity.
- e. Number of test reports and drawings required for review.
- f. Applicable level of preservation, packaging and packing.

6.2.2 Information for contracting officer. When the first article testing and inspection is required, the first article test and inspection may be conducted at the contractor's plant, government or commercial laboratories. When first article testing and inspection is to be performed at a commercial laboratory, the vendor will ensure that the commercial laboratory is acceptable to the procuring activity. The laboratory, in conjunction with the vendor, shall submit a test plan or program to the procuring activity for approval prior to starting the first article testing. The procuring activity will ensure that the test plan fulfills the requirements of this specification.

6.2.3 Contract data requirements. Items of deliverable data required by this specification are cited in the following paragraphs:

<u>Paragraph</u>	<u>Data Requirements</u>	<u>Applicable DID</u>
4.3.1	First article data	DI-E-6105
4.6.1	Quality Conformance Certification	DI-T-2072

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6.3 Definitions.

6.3.1 Leakage. Visible presence of moisture shall not be considered leakage as long as there is not enough moisture to form a drop.

6.3.2 Excessive wear. If original dimensions have been changed or altered by 5 percent or more.

6.3.3 Military specification part number. The military specification part number is a definitive part number which corresponds to the size and class of couplings covered by this specification. The military specification code number (M85061 for MIL-C-85061 with a dash after it, the size code number, and the material code letter are combined to form the definitive military specification part number.

6.4 AS-3747 first article tests. First article testing shall be waived for flexible couplings that have passed the first article test requirements of Naval Air Systems Command purchase description AS-3747.

Custodians:

Navy - AS
Army - AV

Preparing activity:

Navy - AS
(Project No. 4730-0259)

Review Activities:

Army - AV
DLA - CS

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