



AEROSPACE STANDARD	MA2250	
	Issued Reaffirmed	1992-03 2015-08
Coupling Fuel, Flexible Variable Cavity, Threaded Type with Ferrules, Metric		

RATIONALE

MA2250 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Scope:

This Aerospace Specification establishes the requirements for a threaded flexible coupling assembly, hereafter referred to as the assembly, which utilizes ferrules or machined tube end fittings to join tubing and components in aircraft fuel, vent, or other systems. This coupling assembly is designed for use from -54 to 93 °C and at 862 kPa peak working pressure. AS coupling components referenced herein have been qualified to AS1710. Ferrule referenced herein are inch ferrules adapted to metric tubing.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this specification to the extent specified herein.

2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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
AS1712	Coupling Subassembly, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1713	Half Coupling Subassembly, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends

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Documents

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2.1.1 (Continued):

AS1714	Nut Assembly, Self-Locking, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1715	Washer, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1717	Retainer, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1718	Coupling Body, Flexible, Variable Cavity Threaded, Ferrule Type Tube Ends
AS1719	Fitting End, Half-Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type, Design Standard
AS1720	Ferrule End, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type, Design Standard
MA2251	Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends, Envelope Dimensions, Metric
MA2256	Ferrule, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Tube Ends, Metric

2.1.2 U.S. Government: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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 Fireboard
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
MIL-P-116	Preservation - Packaging, Methods of
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
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
FED-STD-H28	Screw-Threads Standards for Federal Services

3. TECHNICAL REQUIREMENTS:

3.1 Qualification:

Full 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 document. The test specimens for qualification of a part or parts shall be completed with qualified part or parts made by another manufacturer. Half coupling parts shall be qualified parts of the full coupling. Axial loading of the half coupling O-ring should be avoided and controlled by tubing installation.

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 purchaser. 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 Fabrication:

The coupling shall be a lightweight, flexible connection with an O-ring seal. It shall be designed for engine feed, pressure fueling or similar applications at 862 kPa static working pressure in sizes up through 100 and for 207 kPa for dump and vent lines in sizes from 114 up to and including size 140. The coupling shall operate at temperature extremes of -54 to 93 °C at static pressures, and -40 to 57 °C for pressure surging and dynamic operation during fueling and flight. The coupling shall function at a maximum misalignment of 4° or with a maximum gap of 6 mm or in combination, a minimum gap of 1.6 mm at a 3° misalignment.

3.3.1 Coupling Components: The coupling assembly shall consist of the following components.

TABLE 1 - Coupling Assemblies

TABLE 1A - Full Coupling Assembly /4/

Quantity	Name	Standard No.
1	Nut Assembly	AS1714
2	Washers	AS1715
2	Ferrules	MA2256 /1/
/5/	Retainer	AS1717
1	Body	AS1718
2	O-ring Seal /2/	

TABLE 1B - Half Coupling Assembly /4/

Quantity	Name	Standard No.
1	Nut Assembly	AS1714
2	Washers	AS1715
1	Ferrule	MA2256 /1/
1	Fitting End	AS1719 /3/
1	O-ring Seal /2/	

NOTES:

- /1/ Ferrules are attached to tubing by roller swaging or bulge forming in accordance with user specifications.
- /2/ Not part of assembly and supplied by user.
- /3/ Recommended design standard and supplied by user.
- /4/ Full coupling subassembly (AS1712) and half coupling subassembly (AS1713) are provided to simplify drawing call outs and to aid in tubing fabrication and installation. Subassemblies consist of components listed above except for ferrules and O-rings. Ferrules are usually installed during the fabrication of tubing. The other coupling components are not needed until final assembly. Tubing ends in accordance with design standard AS1720 may be used with coupling assemblies instead of the ferrule type tube end.
- /5/ Retainer Quantity: 2 halves for sizes 12 to 114; 1 retainer for sizes 124 and 140.

3.3.2 Threads: Threads of nut and body shall be in accordance with Federal Standard H28/2.

3.3.3 Seals: O-rings are not considered a part of this document except for coupling qualification test requirements. O-ring sizes for the couplings are given in Table 2.

TABLE 2 - Fuel System Pressure in kPa and Temperature Requirement in °C

Basic System Criteria (Temperature Range -54 to +94 °C)					Test Requirements								
System	DN Size	Tube Size Inch (Ref)	AS568 O-ring Dash Size (Ref)	Operating Pressure /1/		Peak Working Pressure /2/	Static (Tests) /3/			Dynamic (Tests) /3/			
				Negative kPa	Positive		kPa Proof		Burst Pressure	Test Temperature °C		Flexure Pressure	Surge Pressure
							Negative	Positive		Min	Max		
Engine Feed	12	.50	114	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
	16	.62	116	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
	18	.75	212	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
	25	1.00	216	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
	32	1.25	220	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
Fuel Pressure and Dump	38	1.50	326	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
	45	1.75	328	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
	50	2.00	330	81	414	862	95	1724	-54	93	414	0 to 862	-40 57
Fuel Tank and Vent	56	2.25	332	34	414	862	40	1724	-54	93	414	0 to 862	-40 57
	63	2.50	334	34	414	862	40	1724	-54	93	414	0 to 862	-40 57
	/5/ 76	3.00	338	34	414	862	40	1724	-54	93	414	0 to 862	-40 57
	/5/ 88	3.50	342	34	414	862	40	1724	-54	93	414	0 to 862	-40 57
	100	4.00	346	34	414	862	40	1724	-54	93	414	0 to 862	-40 57
Fuel Tank and Vent	/5/ 114	4.50	426	34	103	207	40	1724	-54	93	103	0 to 207	-40 57
	/5/ 124	5.00	430	34	103	207	40	1724	-54	93	103	0 to 207	-40 57
	/5/ 140	5.50	434	34	103	207	40	1724	-54	93	103	0 to 207	-40 57

NOTES: /1/ The operating pressure shown here is the pressure range between the normal, continuous pump pressure and the maximum negative pressure (suction) that can occur.

/2/ The peak working pressure represents maximum surge conditions, pressure spikes.

/3/ The static test simulates ground operations, the dynamic test simulates flight operations.

/4/ Surge tests are the exception and are conducted at room temperature and at 57 °C (4.6.7).

/5/ These coupling assemblies use nonstandard tube diameters.

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/5/ These coupling assemblies use nonstandard tube diameters.

3.3.4 Dimensions: The coupling assembly envelope dimensions shall be as specified in MA2251. Part dimensions shall be as specified in applicable part standards.

3.3.4.1 Coupling Weight: The coupling assembly and components shall not exceed the maximum weights listed on the applicable part standard drawing.

3.4 Performance:

The coupling assembly shall meet the following performance requirements:

3.4.1 Leakage:

3.4.1.1 Pneumatic Leakage: The assembly shall withstand pneumatic pressure equal to the maximum proof pressure of Table 2 for 3 min at room temperature without any visible bubbles starting after 1 min at pressure or other malfunction, which would affect assembly or disassembly when tested in accordance with 4.6.2.2.1.

3.4.1.2 Liquid Leakage: The assembly when subjected to the tests specified herein shall not allow the escape of fluid or external wetting sufficient to form a drop from any point of the fitting assembly including the fitting-tube junction. This junction is defined to include one tube outside diameter in length beyond the coupling envelope. The envelope is the area from free parent tube material to free parent tube material, boss, or coupling.

3.4.2 Proof Pressure: The assembly shall meet the negative and positive proof pressures listed per 3.4.1 in Table 2. A decrease in negative pressure exceeding .001 kPa within 5 min, leakage per 3.4.1 when pressurized, or evidence of any other malfunction shall be cause for rejection. The test method is specified in 4.6.2.

3.4.3 Fuel Resistance: The coupling assembly shall not leak in excess of 3.4.1 nor show evidence of malfunction when subjected to fuel resistance testing at high temperature fuel aging (93 °C), low temperature fuel aging (-54 °C), and air dry out (93 °C). The test procedure and duration of aging is referenced in 4.6.3.

3.4.4 Vibration: The assembly, when pressurized per 4.6.4, shall show no evidence of malfunction or structural failure and shall not leak in excess of 3.4.1 when pressurized to the proof pressure requirements of 3.4.2 after exposure to vibration levels in accordance with 4.6.4.

3.4.5 Salt Fog: The assembly shall not leak in excess of 3.4.1, when proof tested to the requirements of 3.4.2 and shall show no evidence of excessive corrosion, peeling, chipping or blistering of the finish, or exposure of base metal under plated surfaces after being subjected to the salt fog test. The test method is specified in 4.6.5.

- 3.4.6 Flexure: The assembly shall withstand the Table 2 negative and positive proof pressures after being subjected to a total of 50 000 flexure cycles at room temperature. A decrease in negative pressure exceeding 1.7 kPa within 5 min, leakage in excess of 3.4.1 when pressurized for a minimum of 5 min, or evidence of any other malfunction shall be a cause for rejection. Leakage at -40 °C if observed shall be recorded; it is not cause for rejection. Flexure shall be $\pm 5^\circ$ from an initial misaligned position of 3° . Testing is specified in 4.6.6.
- 3.4.7 Pressure Surge: The assembly shall withstand 50 000 pressure surge cycles as defined in Figure 4 and in Table 2 without evidence of malfunction or leakage in excess of 3.4.1. Testing is specified in 4.6.7.
- 3.4.8 Burst Pressure:
- 3.4.8.1 Burst Pressure Test at Temperature Extremes: The assembly shall not rupture nor show evidence of leakage in excess of 3.4.1 at any pressure up to the Table 2 burst pressures and at the two temperature extremes of -54 to 93 °C. The test procedure is specified in 4.6.8.1.
- 3.4.8.2 Burst at Room Temperature: The assembly shall be pressurized to rupture at room temperature. There shall be no evidence of leakage in excess of 3.4.1 at any pressure up to the burst test pressures listed in Table 2. The pressure at which rupture occurs shall be above the values listed in Table 2. The test procedure is specified in 4.6.8.2.
- 3.5 Marking:
- Coupling assemblies and parts shall be marked for identification in accordance with the applicable AS or MA standard or drawing.
- 3.6 Workmanship:
- Coupling components shall be manufactured and finished in accordance with commercially accepted practices and processes.
- 3.7 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 purchaser for the performance of the inspection and test requirement. The purchaser 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 assure supplies and services conform to prescribed requirements.

4.2 Classification of Inspections:

The examining and testing of assemblies shall be classified as:

- a. a. Qualification inspections (see 4.3)
- b. 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 3. The number of specimens are specified in 4.3.2. Tubing for fabrication of test specimens shall be 6061-T4 in accordance with WW-T-700/6 with wall thickness as shown in Table 4. O-rings per MIL-R-25988/1 shall be used for qualification testing of all specimens.