



AEROSPACE STANDARD

AS1710**REV. D**

Issued 1982-05
Revised 2009-02
Reaffirmed 2014-11

Superseding AS1710C

Coupling, Fuel, Flexible, Variable Cavity,
Threaded Type With Ferrules

RATIONALE

AS1710D has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

This SAE Aerospace Standard (AS) defines the requirements for a threaded flexible coupling assembly, which utilizes ferrules or machined tube end fittings to join tubing and components in aircraft fuel and fuel vent or other systems. This coupling assembly is designed for use from -65 to +200 °F and at 125 psig peak working pressure, and the coupling assembly may be used in other fluid systems when requirements are within the limits.

2. APPLICABLE DOCUMENTS

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

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org

AMS-R-25988	Rubber, Fluorosilicone Elastomer, Oil-and-Fuel-Resistant, Sheet, Strips, Molded Parts, and Extruded Shapes
AMS-WW-T-700/6	Tube, Aluminum Alloy, Drawn, Seamless, 6061
ARP9013	Statistical Product Acceptance Requirements
AS567	Safety Cable, Safety Wire, Key Washers, and Cotter Pins for Propulsion Systems, General Practices for Use of
AS568	Aerospace Size Standard for O-rings
AS1055	Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components
AS1711	Coupling, Flexible, Variable Cavity, Threaded Ferrule Type Tube Ends, Envelope Dimensions Design Standard
AS1712	Coupling Subassembly, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends

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Documents

Document Sharing Hub

AS1713	Half Coupling Subassembly, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1714	Nut Assembly, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1715	Washer, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Type Tube Ends
AS1716	Ferrule, Coupling, Flexible, Variable Cavity, Threaded, Ferrule Tube End
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
AS4060	Tube Fitting Swaged Joint, Roller Expander, Manual Process, Requirements for
AS7003	NADCAP Program Requirements
AS7112	National Aerospace and Defense Contractors Accreditation Program Requirements for Fluid System Components

2.2 U.S. Government Publications

Available from Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

FED-STD-H28/2	Screw-Thread Standards for Federal Services Section 2: Unified Inch Screw Threads - UN and UNR Thread Forms
MIL-HDBK-831	Military Handbook, Preparation of Test Reports
MIL-L-10547	Liners, Case and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible
MIL-PRF-680	Performance Specification, Degreasing Solvent (Stoddard Solvent)
MIL-PRF-7024	Performance Specification, Calibrating Fluids, Aircraft Fuel System Components
MIL-STD-129	Military Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-889	Dissimilar Metals
MIL-STD-2073-1	Department of Defense, Standard Practice for Military Packaging
PPP-B-566	Boxes, Folding, Paperboard
PPP-B-585	Boxes, Wood, Wirebound
PPP-B-676	Boxes, Set-up
VV-P-236	Petrolatum, Technical

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 473	Standard Test Method for Sediment in Crude Oils and Fuel Oils by the Extraction Method
ASTM D 5118/D5118M	Standard Practice for Fabrication of Fiberboard Shipping Boxes
ASTM D 5486/D5486M	Standard Specification for Pressure Sensitive Tape for Packaging, Box Closure, and Sealing
ASTM D 6251/D6251M	Standard Specification for Wood Cleated Panelboard Shipping Boxes

2.4 PRI Publications

Available from Performance Review Institute, 161 Thornhill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

PD2001	Qualified Product Management Council Procedures for Qualified Products Group
PD2101	Aerospace Quality Assurance, Product Standard, Qualification Procedures, Fluid Systems

2.5 ASME Publications

Available from American Society of Mechanical Engineers, 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900, Tel: 973-882-1170, www.asme.org.

ASME B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)

2.6 ANSI Publications

Available on-line at www.asq.org or from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI/ASQC Z.1.4 Sampling Procedures and Tables for Inspection by Attributes.

3. TECHNICAL REQUIREMENTS

3.1 Qualification

Full coupling assemblies furnished under this document shall be products that 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 a qualified part or parts made by other manufacturers. Half coupling parts shall be qualified parts of the full coupling.

3.1.1 Manufacturer Qualification

A manufacturer producing a product in conformance to this procurement specification shall be accredited in accordance with the requirements of PD2101, AS7003 and AS7112, and shall be listed in a Performance Review Institute (PRI) Qualified Manufacturers List (QML).

3.1.2 Product Qualification

All products shall conform to the requirements of this procurement specification and shall be approved in accordance with the requirements of PD2001 and PD2101 for listing in a Performance Review Institute (PRI) Qualified Parts List (QPL).

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 Construction

The coupling shall be a lightweight, flexible connection with O-ring seals. It shall be designed for engine feed and pressure fueling at 125 psig static working pressure in sizes up through -64 and for 30 psig for dump and vent lines in sizes from -72 up to and including size -88. The coupling shall operate at temperature extremes of -65 to +200 °F at static pressures, and -40 to +135 °F for pressure surging and dynamic operation during fueling and flight. The coupling shall function at a maximum misalignment of 4 degrees or with a maximum gap of .250 in, or in combination, a minimum gap of .062 in at a 3 degree misalignment.

3.3.1 Coupling Components

The coupling assembly shall consist of the components shown as follows in Tables 1 and 2:

TABLE 1 - FULL COUPLING ASSEMBLY

Qty	Description	Standard No.
One	Nut Assembly	AS1714
Two	Washers	AS1715
Two	Ferrules	AS1716 /1/
Two	Retainer Halves	AS1717 /2/
One	Body	AS1718
Two	O-rings /3/	
/1/ Ferrules are attached to tubing by roller swaging or bulge forming in accordance with user specifications. Roller swaging shall conform to AS4060.		
/2/ One retainer required for sizes -80 and -88.		
/3/ Not part of assembly and supplied by user.		

TABLE 2 - HALF COUPLING ASSEMBLY

Qty	Description	Standard No.
One	Nut Assembly	AS1714
Two	Washers	AS1715
One	Ferrule	AS1716 /1/
One	Fitting End	AS1719 /2/
One	O-rings /3/	
/1/ Ferrules are attached to tubing by roller swaging or bulge forming in accordance with user specifications. Roller swaging shall conform to AS4060.		
/2/ Recommended design standard and supplied by user.		
/3/ Not part of assembly and supplied by user.		

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 except for ferrules. Ferrules are usually installed during the fabrication of tubing. The other coupling components are not needed until final assembly. Fitting ends in accordance with design standard AS1720 may be used with coupling assemblies instead of the ferrule type tube end.

3.3.2 Threads

Threads shall be in accordance with Federal Standard H28/2 or ASME B1.1.

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 3.

TABLE 3 - FUEL SYSTEM PRESSURE AND TEMPERATURE REQUIREMENT

Basic System Criteria													
Temperature Range -65 to 200 °F													
AS568													
System	Dash Size	Tube Size in	O-ring Dash Size Ref	Operating Pressure /1/		Peak Working Pressure /2/	Proof		Static (Tests) /3/		Test Requirements		Dynamic (Tests) /3/
				Negative in Hg	Positive psig		Negative in Hg	Positive psig	Burst psig	Temperature °F	Flexure psig	Surge psig	
										Min	Max		Min
													Max
Engine Speed	08	.500	114	24	60	125	28	250	375	-65	200	60	0-125
	10	.625	116	24	60	125	28	250	375	-65	200	60	0-125
	12	.750	212	24	60	125	28	250	375	-65	200	60	0-125
	16	1.000	216	24	60	125	28	250	375	-65	200	60	0-125
	20	1.250	220	24	60	125	28	250	375	-65	200	60	0-125
	24	1.500	326	24	60	125	28	250	375	-65	200	60	0-125
	28	1.750	328	24	60	125	28	250	375	-65	200	60	0-125
	32	2.000	330	24	60	125	28	250	375	-65	200	60	0-125
Pressure Fueling and Dump	36	2.250	332	10	60	125	12	250	375	-65	200	60	0-125
	40	2.500	334	10	60	125	12	250	375	-65	200	60	0-125
	44	2.750	336	10	60	125	12	250	375	-65	200	60	0-125
	48	3.000	338	10	60	125	12	250	375	-65	200	60	0-125
	56	3.500	342	10	60	125	12	250	375	-65	200	60	0-125
	64	4.000	346	10	60	125	12	250	375	-65	200	60	0-125
Fuel Tank Vent	72	4.5	426	10	15	30	12	250	375	-65	200	15	0-30
	80	5.0	430	10	15	30	12	250	375	-65	200	15	0-30
	88	5.5	434	10	15	30	12	250	375	-65	200	15	0-30

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 conducted at room temperature and at 135 °F (4.6.7).

3.4 Dimensions

The coupling assembly envelope dimensions shall be as specified in AS1711. 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 Leakage

3.5.1.1 Liquid Leakage

The test assembly shall be subjected to the positive proof pressures listed in Table 3. Any leakage sufficient to form a drop while pressurized or evidence of other malfunctions shall be cause for rejection. The test method is specified in 4.6.2.2.

3.5.1.2 Vacuum Leakage

The test assembly shall be subjected to the negative proof pressures listed in Table 3. A decrease in the negative pressure exceeding .5 in Hg within 5 min shall be cause for rejection. The test method is specified in 4.6.2.1.

3.5.1.3 Pneumatic Leakage

The test assembly shall be subjected to a pneumatic pressure equal to the proof pressure listed in Table 3 for a period of 3 min at room temperature. Any evidence of pneumatic leakage after 1 min at pressure or other malfunctions that would affect the performance of the assembly will be cause for rejection when tested as specified in 4.6.2.3.

3.5.2 Fuel Resistance

The coupling assembly shall not leak (sufficient to form a drop) nor show evidence of malfunction when subjected to fuel resistance testing at high temperature fuel aging at +200 °F, low temperature fuel aging at -65 °F, and air dry out at +200 °F. The test procedure and duration of aging is specified in 4.6.3.

3.5.3 Vibration

The coupling assembly shall show no evidence of malfunction or structural failure and shall not leak (sufficient to form a drop) when subjected to the proof pressure requirements of 3.5.1 after exposure to vibration levels in accordance with 4.6.4.

3.5.4 Salt Fog

The coupling assembly shall not leak (sufficient to form one drop) when proof tested to the requirements of 3.5.1 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.

3.5.5 Flexure

The coupling assembly shall withstand the Table 3 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 .5 in Hg within 5 min, leakage sufficient to form a drop when pressurized for a minimum of 5 min, or evidence of any other malfunction shall be a cause for rejection. Flexure shall be ± 5 degrees from an initial misaligned position of 3 degrees. Testing is specified in 4.6.6.

3.5.6 Pressure Surge

The coupling assembly shall withstand 50 000 pressure surges as defined in Figure 5 and in Table 3 without evidence of malfunction or leakage (sufficient to form a drop). Testing is specified in 4.6.7.

3.5.7 Burst Pressure

3.5.7.1 Burst Pressure Test at Temperature Extremes

The coupling assembly shall not rupture nor show evidence of leakage (sufficient to form a drop) at any pressure up to the Table 3 burst pressures and at the two temperature extremes. The test procedure is specified in 4.6.8.1.

3.5.7.2 Burst at Room Temperature

The assembly shall be pressurized to rupture at room temperature. There shall be no evidence of leakage (sufficient to form a drop) at any pressure up to the burst test pressures listed in Table 3. The pressure at which rupture occurs shall be above the values listed in Table 3. The test procedure is specified in 4.6.8.2.

3.6 Identification of Product

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

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 requirements. 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. Qualification inspections (see 4.3)
- b. Quality conformance inspections (see 4.4)