



AEROSPACE STANDARD

AS5000™**REV. E**Issued 2006-03
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Superseding AS5000D

Fitting, Plug-in Union, Ring Locked, 24 Degree Cone, Fluid Connection,
5080 psi (35000 kPa), Specification for

RATIONALE

Updated 4.5.3 Periodic Control Tests to a 12-month interval.

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1. SCOPE

This SAE Aerospace Standard (AS) establishes the requirements for 24 degree cone AS5827 or EN 6123 flareless ring locked fitting assemblies per AS5550 and AS5865, for use in aircraft fluid systems at nominal operating pressure of 5080 psi (35000 kPa) maximum and operating temperature range of -65 to +275 °F (-54 to +135 °C).

The general requirements shall be for, but not limited to, commercial aircraft hydraulic components per AS4941, using port configuration as specified in AS5551.

1.1 Classifications

Type 1 Standard requirement for Proof, Tensile, Fire, and Vibration Test

Type 2 Alternate requirement for Proof, Tensile, Fire, and Vibration Test

NOTE: Type 1 meets requirements of both types.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2486	Conversion Coating of Titanium Alloys Fluoride-Phosphate Type
AMS2488	Anodic Treatment - Titanium and Titanium Alloys, Solution pH 13 or Higher
AMS2700	Passivation of Corrosion Resistant Steels
AMS4928	Titanium Alloy, Bars, Wire, Forgings, Rings, and Drawn Shapes, 6Al - 4V, Annealed
AMS4965	Titanium Alloy, Bars, Wire, Forgings, and Rings, 6.0Al - 4.0V, Solution Heat Treated and Aged
AMS4967	Titanium Alloy, Bars, Wire, Forgings, and Rings, 6.0Al - 4.0V, Annealed, Heat Treatable
AMS5731	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1800 °F (982 °C) Solution Heat Treated
AMS5732	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1800 °F (982 °C) Solution and Precipitation Heat Treated
AMS5734	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, and Tubing, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1650 °F (899 °C) Solution Heat Treated
AMS5737	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, and Tubing, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1650 °F (899 °C) Solution and Precipitation Heat Treated
ARP5412	Aircraft Lightning Environment and Related Test Waveforms

ARP5416	Aircraft Lightning Test Methods
AS478	Identification Marking Methods
AS603	Impulse Testing of Hydraulic Hose, Tubing, and Fitting Assemblies
AS1055	Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components
AS1241	Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft
AS2094	Test Methods for Tube-Fitting Assemblies
AS4941	Aerospace - General Requirements for Commercial Aircraft Hydraulic Components
AS5272	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting, Procurement Specification
AS5550	Fitting Assembly, Ring Locked, Adapter, Flareless to Port, Extra Fine Threads, 5080 psi
AS5551	Fitting Assembly - 24 Degree Cone Flareless per AS5827, 5080 psi, Port Connection, Port Preparation, Installation and Removal of AS5550 and AS5865
AS5620	Titanium Hydraulic Tubing, Ti-3Al-2.5V Cold Worked and Stress Relieved, Up to 35000 kPa (5080 psi), Requirements for Qualification Testing and Control
AS5827	Fitting End, Flareless, Extra Fine Thread, Design Standard
AS5865	Fitting Reducer Assembly, Ring Locked, Adapter, Flareless to Port, Extra Fine Threads, 5080 psi
AS5975	Fitting Assembly, Straight, Male, Flareless, Axially Swaged, Hydraulic, 5080 psi
AS7003	Nadcap - Program Requirements
AS7112	National Aerospace and Defense Contractors Accreditation Program Requirements for Fluid System Components
AS8879	Screw Threads - UNJ Profile, Inch, Controlled Radius Root with Increased Minor Diameter

2.1.2 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

FED-STD-595	Colors Used in Government Procurement
MIL-HDBK-1655	Fittings, Flareless, Classification of Defects of
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base

2.1.3 AECMA Publications

Available on-line at <http://www.aecma-stan.org/sales/bookstore.asp> or from AECMA, 94-b.5, B-1200 Brussels, Belgium.

EN 6123	Fitting End, 24° Internal Cone, Extra Fine Thread, Flareless Type
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2.1.4 ASQ Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada), 001-800-514-1564 (Mexico) or +1-414-272-8575 (all other locations), www.asq.org.

ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes
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2.1.5 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME Y14.38 Abbreviation for Use on Drawings and in Text

2.1.6 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 A370 Steel Products, Mechanical Testing of

2.1.7 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 2685 Resistance to Fire in Designated Fire Zones

ISO 3161 Aerospace - UNJ Threads, with Controlled Root Radius, for Aerospace - Inch Series

ISO 6773 Aerospace - Fluid Systems - Thermal Shock Testing of Piping and Fittings

ISO 7137 Aircraft - Environmental Conditions and Test Procedures for Airborne Equipment

ISO 7257 Aircraft - Hydraulic Tubing Joints and Fittings - Rotary, Flexure Test

ISO 10583 Aerospace Fluid Systems - Test Methods for Tube/Fitting Assemblies

2.1.8 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NAS1638 Cleanliness Requirements of Parts Used in Hydraulic Systems

2.1.9 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill 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

PRI-QPL-AS5000 Fittings, Ring Locked, Flareless per AS5827, 5080 psi, Fluid Connection

2.1.10 RTCA Publications

Available from RTCA, Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA/DO-160 Environmental Conditions and Test Procedures for Airborne Equipment

2.2 Abbreviations and Acronyms

Standard abbreviations used in this document and frequently used in aerospace technical documents may be found in ASME Y14.38.

2.3 Definitions

Definitions of terms used in this document and frequently used in aerospace technical documents may be found in the SAE Dictionary of Aerospace Engineering.

3. TECHNICAL REQUIREMENTS

3.1 Qualification

3.1.1 Product Qualification

Fittings furnished under this specification shall be representative of products which have been qualified to the requirements of 3.6 and 4.4. 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 the Performance Review Institute (PRI) Qualified Products List (QPL) PRI-QPL-AS5000.

3.1.2 Manufacturer Qualification

A manufacturer producing a product in conformance to this procurement specification shall be accredited in accordance with the requirements of PD2101, AS7003, AS7112, and AS7112/2, and shall be listed in a Performance Review Institute (PRI) Qualified Manufacturers List (QML).

3.1.3 Retention of Qualification

The manufacturer shall certify in intervals not exceeding two years that the products listed in PRI-QPL-AS5000 are still available from the listed plant. The manufacturer shall forward his certification letter to PRI for approval. PRI shall confirm retention of qualification. Periodic control tests (4.5.3) shall be performed and reported to PRI accordingly.

3.2 Material

Fittings shall be fabricated of materials listed in Table 1 and in compliance with requirements in this specification or as specified on the applicable part standard drawings.

Table 1 - Materials

Titanium alloy Ti 6Al-4V per AMS4928, AMS4965, or AMS4967
CRES A-286 per AMS5731, AMS5732, AMS5734, or AMS5737

3.2.1 Heat Treatment

3.2.1.1 Titanium Alloy

Titanium alloy fittings shall be supplied in the final temper as shown in Table 1. When fitting material is purchased in other than the final temper, the heat treatment of the raw material shall be as specified on the applicable part standard drawings.

3.2.1.2 CRES

Unless otherwise specified on the applicable part standard drawings, the hardness of the finished A-286 corrosion resistant steel parts shall be 30 HRC minimum.

3.3 Design and Fabrication

The design and fabrication of the fittings shall be in accordance with the applicable part standard drawings. The fitting ends shall be in accordance with AS5827 or EN 6123 as appropriate.

Dimensional requirements are applicable after heat treatment and protective finishing.

3.3.1 Passages

3.3.1.1 Machining Offset

The offset between the machined holes at the meeting point of the holes shall not exceed 0.010 inch (0.254 mm). It shall be possible to pass through the fluid passage a ball whose diameter is 0.015 inch (0.381 mm) less than the minimum diameter specified for the passage.

3.3.2 Threads

Threads shall be per ISO 3161 or AS8879 as applicable, except that the root radius is not required on incomplete threads. External threads on titanium alloy and corrosion resistant steel may be produced by a single point method, cut or rolled.

NOTES: 1. Threads shall not be grit or bead blasted unless required as preparation for application of solid film lubricant.

2. Gaging and conformance requirements for ISO 3161 threads shall follow practices outlined under AS8879 Category I.

3.4 Finish

3.4.1 Titanium Alloy Fittings

Titanium alloy fitting assemblies shall be anodic treated per AMS2488 or fluoride phosphate coated per AMS2486, except that a pre-treatment, a modification of the fluoride treatment, or a post-treatment shall be applied so that the final color of the fittings should be approximately dull gray. Sealing surfaces shall not be bead or grit blasted.

3.4.2 A-286 Corrosion Resistant Steel Fittings

Corrosion resistant steel fitting assemblies shall be solid film lubed per AS5272, Type 2 on all surfaces except none in flow hole. The final color of the fitting assemblies should be approximately gray.

3.4.3 A-286 lockring shall be passivated per AMS2700, and PTFE coating with white color for 5080 psi (35000 kPa) identification purpose.

3.5 Identification of Product

All fitting assemblies shall be marked in accordance with AS478 Class C or D or Method 2 or 35, as specified on the applicable part standard drawings in a location not detrimental to the performance of the fitting and not detrimental to the corrosion protection of the fitting.

NOTE: When items cannot be physically marked because of lacking space or because marking would have a deleterious effect, the package shall provide the identification per 5.3.

3.5.1 Manufacturer's Identification

Unless otherwise specified, all fittings shall be marked with the manufacturer's name, CAGE code number, or trademark. Package marking identification shall include lot number.

3.5.2 Size, Method, and Location of Marking

Marking shall be accomplished per those permanent methods listed in AS478 which do not cause surface oxidation or other detrimental effects.

3.5.3 Color Identification

In addition to the markings specified, the fitting assemblies shall be identified by the following colors:

- a. Titanium Alloys: Dull gray (see 3.4.1) similar to color number 26081 through 26293, or 36081 through 36293, per FED-STD-595
- b. CRES: Gray (see 3.4.2)

NOTE: Not meeting the exact color requirements shall not be cause for rejection.

3.6 Performance

Assemblies shall meet requirements per 3.6.1 through 3.6.17. Port ends of plug-in unions shall be installed per AS5551. Tooling for port preparation, installation, and removal of plug-in unions shall be per AS5551. Fitting nuts and tube ends or caps shall be installed on tube fitting ends of plug-in unions per 4.4.2.5, and tightened to torques specified in Table 5 shall meet the requirements 3.6.2 through 3.6.17.

3.6.1 Environmental Conditions

Fitting assembly shall meet the performance requirements in accordance with this specification when subjected to the natural and induced environments specified herein.

3.6.1.1 Temperature

- a. Ambient Air: -65 to +275 °F (-54 to +135 °C)
- b. Fluid: -65 to +275 °F (-54 to +135 °C)

3.6.1.2 Hydraulic Pressures

- a. Operating Pressure: 5080 psi (35000 kPa)
- b. Proof Pressure: 10160 psi (70000 kPa), alternate 7620 psi (52500 kPa) as specified by user
- c. Burst Pressure: 20320 psi (140000 kPa)

3.6.2 Proof Pressure

The fitting assembly shall withstand proof pressure for 3 minutes without leakage, evidence of permanent deformation, or other malfunction, when tested in accordance with 4.6.2.

3.6.3 Pneumatic Pressure

The fitting assembly shall be capable of containment of nitrogen gas without evidence of gas bubbles when tested in accordance with 4.6.3.

3.6.4 Impulse

The fitting assembly shall withstand 300000 impulse pressure cycles at a peak pressure of 150% of operating pressure without leakage when tested in accordance with 4.6.4.

3.6.5 Minimum Burst Pressure Test

The fitting assembly shall withstand burst pressure without any visible leakage, slippage, or other failure, when tested in accordance with 4.6.5.

3.6.6 Flexure

The fitting assembly when subjected to the stress levels specified in Table 2 shall withstand 10^7 (10 million) flexure cycles without leakage when tested in accordance with 4.6.6.

Bending stress levels are applicable to titanium or CRES fittings assembled to titanium 3Al-2.5V titanium tubing per AS5620.

Table 2 - Bending stress level

Fitting Assembly Size	Dynamic Bending Stress	
	(0 to 10%)	
	psi	MPa
04	20000	137.9
06	19000	131.0
08	18000	124.1
10	17000	117.2
12	16000	110.3
16	15000	103.4
20	14000	96.5

3.6.7 Repeated Assembly

The test assembly shall withstand eight repeated assemblies and four installations and removals on the port end side when tested in accordance with 4.6.7.

3.6.8 Tensile Load

The fitting assembly when assembled without pressure shall withstand an axial load per Table 3 without separation when tested in accordance with 4.6.8.

Table 3 - Tensile loads

Fitting Assembly Size	Tensile Load		Tensile Load	
	Type 1 - Standard		Type 2 - Alternate	
	lbf	Newton	lbf	Newton
04	1400	6228	997	4435
06	2700	12010	2244	9982
08	4800	21351	3990	17748
10	7500	33362	6234	27730
12	10500	46706	8977	39932
16	18600	82737	15959	70990
20	29200	129888	24936	110921

3.6.9 Thermal Shock

The fitting assembly shall withstand the temperature and pressure without leakage, evidence of permanent deformation, or other malfunction, when tested in accordance with 4.6.9.

3.6.10 Overtightening

The fitting assembly when torque tested at both fitting end connections and in accordance with 4.6.10 shall not leak during the proof test and pneumatic test.