

1.0 SCOPE

- 1.1 This specification describes the fabrication and assembly of flareless fitting tube and hose connections. It applies only to those fitting ends, fitting parts, tube sizes and tube materials described herein.

2.0 APPLICABLE DOCUMENTS

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

2.1.1 Military Specifications

~~JAN-A-669~~ — ~~Anti-Seize Compound White Lead Base, General Purpose For Threaded Fittings~~
~~MIL-T-6845~~ — ~~Tubing Steel, Corrosion-Resisting (18-8) Aircraft, Hydraulic System~~
~~MIL-T-7081~~ — ~~Tube Aluminum Alloy, Seamless Round, 6061 and 6062, Aircraft Hydraulic Quality~~
~~MIL-T-8504~~ — ~~Tubing, Steel, Corrosion-Resistant (18-8) Annealed, Aircraft Hydraulic System~~
~~MIL-T-8808~~ — ~~Tubing Steel, Corrosion-Resistant (18-8) Stabilized Aircraft Hydraulic Quality~~

2.1.2 Federal Specification

~~WW-T-787~~ — ~~Tubing, Aluminum Alloy 52S, Round, Seamless, Drawn~~
~~TT-S-1732~~ — ~~Sealing Compound: Joint and Thread, Lead Free General Purpose~~

2.1.3 Drawings

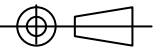
~~MS21917~~ — ~~Nut-Sleeve Coupling Flareless~~
~~MS21918~~ — ~~Sleeve-Coupling, Flareless~~
~~MS21921~~ — ~~Nut, Sleeve Coupling Flareless~~
~~MS21922~~ — ~~Sleeve, Coupling Flareless~~
~~MS33514~~ — ~~Fitting End, Standard Dimensions For Flareless Tube Connection and Gasket Seat~~
~~MS33515~~ — ~~Fitting End, Standard Dimensions For Bulkhead Flareless Tube Connections~~

2.1.4 Industry Standards

SAE International
~~AMS-WW-T-700/4~~ — ~~Tube, Aluminum Alloy, Drawn, Seamless, 5052~~
~~AS21921~~ — ~~Nut, Sleeve Coupling, Flareless~~
~~AS21922~~ — ~~Sleeve, Coupling, Flareless~~
~~AS33514~~ — ~~Fitting End, Standard Dimensions for Flareless Tube Connection and Gasket Seal~~
~~AS33515~~ — ~~Fitting End, Standard Dimensions for Bulkhead Flareless Tube Connections~~
~~AMS4083~~ — ~~Aluminum Alloy Tubing, Hydraulic, Seamless, Drawn, Round 1.0Mg - .60Si - .28Cu - .20Cr (6061-T6) Solution and Precipitation Heat Treated - Ref. UNS 96061~~
~~AMS-T-6845~~ — ~~Tubing, Steel, Corrosion-Resistant (S30400), Aerospace Vehicle Hydraulic System 1/8 Hard Condition~~

Copies can be obtained from SAE International, 400 Commonwealth Dr., Warrendale, PA 15096-0001. www.sae.org

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THIRD ANGLE PROJECTION 	CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 1
PROCUREMENT SPECIFICATION NONE	TITLE FLARELESS FITTING CONNECTIONS, FABRICATION AND ASSEMBLY	CLASSIFICATION SPECIFICATION ①
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3.0 REQUIREMENTS

3.1 Fittings

3.1.1 Fitting ends shall be in accordance with ~~MS23514~~ AS33514 or ~~MS33515~~ AS33515. Nuts shall be in accordance with MS21917 or ~~MS21921~~ AS21921 and sleeves in accordance with MS21918 or ~~MS21922~~ AS21922.

3.2 Tubing

3.2.1 Recommended Tubing materials are Aluminum Alloy 6061-T6 (~~MIL-T-7081~~ AMS4083), 5052-O (~~WW-T-7081~~ AMS-WW-T-700/4) or equivalent; Annealed Stainless Steel 304-1A (MIL-T-8504) 321-1A (MIL-T-8808), 347-1A (MIL-T-8808) or equivalent; or Stainless Steel 304-1/8 H (~~MIL-T-6845~~ AMS-T-6845) or equivalent.

3.2.2 Minimum wall thicknesses are per Table I. These minimum wall thicknesses are values for which there is satisfactory production experience. Wall thicknesses less than those shown in Table I would perhaps be satisfactory under proper controls, but are not covered by this specification.

TABLE I – MINIMUM WALL THICKNESS OF TUBING

Tube Size	Without Mandrels		With Mandrels
	Annealed Stainless Steel and Aluminum Tubing Wall Thickness	1/8 Hard Stainless Steel Tubing Wall Thickness	Wall Thickness All Materials
2	.022	.018	.016
3	.022	.018	.016
4	.028	.018	.016
5	.028	.018	.018
6	.028	.022	.020
8	.035	.028	.025
10	.042	.028	.028
12	.042	.035	.032
16	.049	.042	.032
20	.049	.049	.035
24	.058	.058	.035
32	.058	.058	.042

3.2.3 Tubing end preparation shall be as follows:

Tubes shall be cut square within 1/2° and all burrs removed from inside and outside of tube ends. The break or chamfer on either the outside diameter or inside diameter shall not exceed 25% of the thickness of the tube wall.

3.3 Presetting of Sleeves

Sleeves must be preset on the tubing before assembly with the fitting. The three approved presetting methods in order of preference are: Machine presetting, hand tool presetting, and hand presetting using steel fittings. Tubing end shall be firmly seated against shoulder in presetting tool or fitting before applying setting force to sleeve. (Use of mandrels is optional in all methods except when hand presetting thin wall tubing of certain diameters as specified in Table IV).

3.3.1 Machine Presetting

3.3.1.1 Machine presetting tools shall be in accordance with Paragraph 3.3.4.

3.3.1.2 Machine preset forces shall be sufficient to produce a satisfactory preset. See Table II for recommended values.

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TABLE II – RECOMMENDED PRESETTING FORCES

TUBING		ALUMINUM		ANNEALED STAINLESS		STAINLESS STEEL	
Size	O.D.	Wall (Ref)	Force ± 200 lbs.	Wall (Ref)	Force ± 200 lbs.	Wall (Ref)	Force ± 200 lbs.
2	1/8	.020	1,200			.016	2,000
3	3/16	.018	1,000				
3	3/16	.028-.035	1,600			.018-.020	2,500
4	1/4	.020-.035	2,000			.016-.020	3,000
4	1/4					.028	3,500
5	5/16	.028-.049	2,400			.020-.022	3,200
6	3/8	.020-.028	2,200	.035-.042	3,500	.020	3,200
6	3/8	.035-.049	2,800			.025-.035	4,000
8	1/2	.028	3,500				
8	1/2	.035-.049	4,000	.049	5,000	.028-.035	6,000
8	1/2	.065	4,500			.049	7,000
10	5/8	.028-.035	4,000			.028	5,000
10	5/8	.049-.083	4,500			.035-.049	7,000
12	3/4	.028-.035	3,500			.028	7,500
12	3/4	.049	4,500			.042-.065	9,000
12	3/4	.095	6,000				
16	1.0	.035	6,500				

3.3.1.3 **Lubrication.** The sleeve and working surfaces of the tooling shall be lubricated with the approved system lubricant, except for oxygen lines. For oxygen, no lubricant shall be used.

3.3.2 Hand Tool Presetting

3.3.2.1 Hand presetting tools shall be in accordance with Paragraph 3.3.4

3.3.2.2 When torque wrenches are used for hand presetting, torque values shall be in accordance with Tables IVa and IVb. If number of turns are used to control hand presetting, the nut should be tightened with a standard wrench until a distinct increase in torque occurs, then should be tightened further the number of turns shown in Tables III, IVa and IVb.

3.3.2.3 **Lubrication.** The sleeve and working surfaces and threads of the tool should be lubricated, except for oxygen lines. Because lubricant cannot be used when presetting sleeves on oxygen lines, torque should not be used to control amount of preset.

3.3.3 Hand Presetting Using Steel Fittings

3.3.3.1 Where a presetting machine or hand preset tool is not available, the sleeve may be preset by using a steel fitting in place of the hand preset tool. The steel fitting should not be used more than five times for presetting.

TABLE III – TURN VALUES FOR PRESETTING WITH MANDRELS

Tube Size	2	3	4	5	6	8	10 Thru 32
No. of Turns	1-1/6		1		5/6		2/3

3.3.3.2 Torque values or number of turns for presetting shall be in accordance with Paragraph 3.3.2.2.

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