

SAE-AMS6361**ADOPTION NOTICE**

SAE-AMS6361, "Steel Tubing, Seamless Round 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) 125,000 psi (862 MPa) Tensile Strength", was adopted on 13-JAN-95 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: ASC/ENOSD, Building 125, 2335 Seventh Street, Suite 6, Wright-Patterson AFB, OH 45433-7809. DoD activities may obtain copies of this standard from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. The private sector and other Government agencies may purchase copies from the Society of Automotive Engineers Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-6361

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Superseding AMS-6361B

Submitted for recognition as an American National Standard

STEEL TUBING, SEAMLESS ROUND
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
125,000 psi (862 MPa) Tensile Strength

UNS G41300

1. SCOPE:

1.1 Form: This specification covers an aircraft-quality, low-alloy steel in the form of round, seamless tubing having a wall thickness not greater than 0.188 inch (4.78 mm).

1.2 Application: Primarily for use in thin wall-thickness sections where a minimum tensile strength of 125,000 psi (862 MPa) is required.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification 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.

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

2.1.1 Aerospace Material Specifications:

AMS-2253 - Tolerances, Carbon and Alloy Steel Tubing
MAM-2253 - Tolerances, Metric, Carbon and Alloy Steel Tubing
AMS-2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS-2301 - Aircraft Quality Steel Cleanliness, Magnetic Particle Inspection Procedure
AMS-2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock
AMS-2640 - Magnetic Particle Inspection

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- 2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 370 - Mechanical Testing of Steel Products

ASTM E 112 - Determining Average Grain Size

ASTM E 350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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

- 2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.28	0.33
Manganese	0.40	0.60
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.80	1.10
Molybdenum	0.15	0.25
Nickel	--	0.25
Copper	--	0.35

- 3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS-2259.

- 3.2 Condition: Hardened by quenching from a temperature within the range 1500° - 1600°F (816° - 871°C) and tempered to meet the requirements of 3.4.1.

- 3.3 Fabrication: Tubing shall be produced by a seamless process. Any surface finishing operation applied to remove objectionable pits and surface blemishes shall be performed prior to final heat treatment. A light polish to improve surface appearance may be employed after final heat treatment.

- 3.4 Properties: Tubing shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A 370:

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3.4.1 Tensile Properties:

Tensile Strength, minimum	125,000 psi (862 MPa)
Yield Strength at 0.2% Offset, minimum	100,000 psi (689 MPa)
Elongation in 2 inches (50.8 mm), minimum	
Full Tube	12%
Strip	7%

3.4.2 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, determined in accordance with ASTM E 112.

3.4.3 Decarburization:

3.4.3.1 Tubing ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces. Decarburization on tubing ID shall not exceed the maximum depth specified in Table I.

3.4.3.2 Allowable decarburization of pierced billets, of tubing for redrawing, or of tubing ordered to specified microstructural requirements shall be as agreed upon by purchaser and vendor.

3.4.3.3 Tubing to which 3.4.3.1 or 3.4.3.2 is not applicable shall be free from complete decarburization. Partial decarburization shall be not greater than shown in Table I.

TABLE I

Ø	Nominal Wall Thickness (T) Inch	Depth of Partial Decarburization, Inch		
		ID	OD	ID & OD
	Up to 0.040, incl	0.18T	0.18T	0.25T
	Over 0.040 to 0.050, incl	0.009	0.009	0.012
	Over 0.050 to 0.070, incl	0.010	0.010	0.014
	Over 0.070 to 0.080, incl	0.012	0.012	0.016
	Over 0.080 to 0.090, incl	0.014	0.014	0.018
	Over 0.090 to 0.100, incl	0.015	0.015	0.020
	Over 0.100 to 0.150, incl	0.017	0.017	0.022
	Over 0.150 to 0.188, incl	0.020	0.020	0.026

TABLE I (SI)

Nominal Wall Thickness Millimetres	Depth of Partial Decarburization, Millimetre		
	ID	OD	ID & OD
Up to 1.02, incl	0.18T	0.18T	0.25T
Over 1.02 to 1.27, incl	0.23	0.23	0.30
Over 1.27 to 1.78, incl	0.25	0.25	0.36
Over 1.78 to 2.03, incl	0.30	0.30	0.41
Over 2.03 to 2.29, incl	0.36	0.36	0.46
Over 2.29 to 2.54, incl	0.38	0.38	0.51
Over 2.54 to 3.81, incl	0.43	0.43	0.56
Over 3.81 to 4.78, incl	0.51	0.51	0.66

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3.4.3.4 Decarburization shall be measured by the microscopic method or by Rockwell Superficial 30-N scale or equivalent hardness testing method on hardened but untempered specimens protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by a hardness method, is defined as the perpendicular distance from the surface to the depth under that surface below which there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization or lack of decarburization thereon.

3.4.3.4.1 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the above limits by more than 0.005 inch (0.13 mm) and the width is 0.065 inch (1.65 mm) or less.

3.5 Quality:

3.5.1 Steel shall be aircraft quality conforming to AMS-2301.

3.5.2 Tubing, as received by purchaser, shall be uniform in quality and condition and shall have a finish conforming to the best practice for high quality aircraft tubing. It shall be smooth and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits, and other imperfections detrimental to usage of the tubing. Surface imperfections such as handling marks, straightening marks, light mandrel and die marks, shallow pits, and scale pattern will not be considered injurious if the imperfections are removable within the tolerances specified for wall thickness but removal of such imperfections is not required.

3.5.2.1 When specified, the tubing, either with or without machining of the surfaces, shall be subjected to magnetic particle inspection in accordance with AMS-2640 or other method acceptable to purchaser. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight tubing will be acceptable in mill lengths of 6 - 20 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

3.7 Tolerances: Shall conform to all applicable requirements of AMS-2253 or MAM-2253.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of tubing shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to the requirements of this specification.

4.2 Classification of Tests: Tests for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.