SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5570 | REV. Q

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Superseding AMS5570P

Steel, Corrosion and Heat-Resistant, Seamless Tubing
18Cr - 11Ni - 0.40Ti (321)
Solution Heat Treated

(Composition similar to UNS S32100)

RATIONALE

AMS5570Q revises Tensile Properties (3.4.1, Table 2) and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant steel in the form of seamless tubing.

1.2 Application

This tubing has been used typically for parts requiring both corrosion and heat resistance, especially when such parts are welded during fabrication, and also for parts requiring oxidation resistance up to 1500 °F (816 °C), but useful at that temperature only when stresses are low, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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http://www.sae.org/technical/standards/AMS5570Q

2.1 SAE Publications

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

AMS2243 Tolerances, Corrosion and Heat-Resistant Steel Tubing

AMS2248 Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

2.2 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 A 262 Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

ASTM A 632 Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service

ASTM A 370 Mechanical Testing of Steel Products

ASTM E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - COMPOSITION

Element	min	max
Carbon	--	0.08
Manganese	--	2.00
Silicon	0.25	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	17.00	19.00
Nickel	9.00	13.00
Titanium	5x(C+N)	0.70
Molybdenum	--	0.75
Copper	--	0.75
Nitrogen	--	0.10

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3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.2 Condition

Solution heat treated and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled.

3.3 Fabrication

Tubing shall be produced by a seamless process. Finishing operations for removal of surface blemishes shall be performed prior to final solution heat treatment. A light polish to improve external surface appearance may be employed after solution heat treatment.

3.4 Properties

Tubing shall conform to the following requirements; tensile testing shall be performed in accordance with ASTM A 370:

3.4.1 Tensile Properties

Shall be as shown in Table 2.

TABLE 2A - TENSILE PROPERTIES, INCH/POUND UNITS

Nominal OD Inch	Wall Thickness Inch	Tensile Strength Ksi[1]	Yield Strength, min KSI 0.2% Offset[2]	Elongation in 2 inches %, min Strip	Elongation in 2 inches %, min Full Tube
Up to 0.188, incl	Up to 0.016, incl	75-120	30	--	33
	Over 0.016	75-105	30	--	35
Over 0.188 to 0.500, incl	Up to 0.010, incl	75-115	30	30	35
	Over 0.010	75-105	30	30	35
Over 0.500	Up to 0.010, incl	75-120	30	25	30
	Over 0.010	75-105	30	30	35

TABLE 2B - TENSILE PROPERTIES, SI UNITS

Nominal OD Millimeters	Nominal Wall Thickness Millimeter	Tensile Strength MPa[1]	Yield Strength, min MPa 0.2% Offset[2]	Elongation in 50.8 mm %, min Strip	Elongation in 50.8 mm %, min Full Tube
Up to 4.78, incl	Up to 0.41, incl	517-827	207	--	33
	Over 0.41	517-724	207	--	35
Over 4.78 to 12.70, incl	Up to 0.25, incl	517-793	207	30	35
	Over 0.25	517-724	207	30	35
Over 12.70	Up to 0.25, incl	517-827	207	25	30
	Over 0.25	517-724	207	30	35

[1] Minimum tensile properties have been taken from ASTM A 632, and have not been substantiated using the procedures of SAE/AMS Metals Division.

[2.] Yield strength is not required to be determined for OD sizes less than 0.125 inch (3.2 mm) or for wall thicknesses less than 0.015 inch (.38 mm).

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3.4.2 Flarability

Specimens as in 4.3.1 shall withstand flaring at room temperature, without formation of cracks or other visible defects, by being forced axially with steady pressure over a hardened and polished tapered steel pin having a 74 degree included angle to produce a flare having a permanent expanded OD not less than specified in Table 3.

TABLE 3A - MINIMUM FLARABILITY, INCH/POUND UNITS

Nominal OD Inch	Expanded OD Inch	Nominal OD Inches	Expanded OD Inches
0.125	0.200	0.750	0.937
0.188	0.302	1.000	1.187
0.250	0.359	1.250	1.500
0.312	0.421	1.500	1.721
0.375	0.484	1.750	2.106
0.500	0.656	2.000	2.356
0.625	0.781		

TABLE 3B - MINIMUM FLARABILITY, SI UNITS

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
3.18	5.08	19.05	23.80
4.78	7.67	25.40	30.15
6.35	9.12	31.75	38.10
7.92	10.69	38.10	43.71
9.52	12.29	44.45	53.49
12.70	16.66	50.80	59.84
15.88	19.84		

3.4.2.1 Tubing with nominal OD between any two standard sizes given in Table 3 shall take the same percentage flare as that for the larger of the two sizes.

3.4.3 Susceptibility to Intergranular Attack

Specimens from tubing, after sensitizing treatment, shall pass the intergranular corrosion test performed in accordance with ASTM A 262, Practice E. After immersion, tubing shall not exhibit intergranular attack or cracks when tested in accordance with the following:

3.4.3.1 Examination of OD Surface

Shall be performed after flattening a 1-inch (25-mm) long specimen to a total thickness under load of three times the wall thickness.

3.4.3.2 Examination of ID Surface

Shall be performed after splitting a 1-inch (25-mm) long specimen and folding the split specimen, with ID surfaces on the outside of fold, around a mandrel having a diameter equal the nominal wall thickness of the tube.

3.4.3.2.1 Tubing Over 0.625-inch (15.88-mm) in OD

The axis of the fold shall be parallel to the axis of the tube.

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