

Steel, Corrosion Resistant, Welded Tubing
19Cr - 9.5Ni (304)
Solution Heat Treated

(Composition similar to UNS S30400)

RATIONALE

AMS5565L revises Condition (3.2), Fabrication (3.3) and Properties (3.4, Table 2 to remove reference to bend testing which is not a requirement in this specification) and to insert minimum tensile strengths using values from ASTM A 249, and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion-resistant steel in the form of welded tubing.

1.2 Application

This tubing has been used typically for parts, such as fluid-conducting lines not subjected to high pressure, requiring good corrosion resistance, but usage is not limited to such applications. Welding, brazing, or other exposure to temperatures over 800 °F (427 °C) during fabrication may impair corrosion resistance.

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.

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.

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

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2013 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: <http://www.sae.org>

**SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/AMS5565L>**

AMS2634 Ultrasonic Inspection, Thin Wall Metal Tubing

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 370 Mechanical Testing of Steel Products

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

ASTM E 426 Electromagnetic (Eddy-Current) Examination of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys

ASTM E 1417 Liquid Penetrant Testing

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	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.03
Chromium	18.00	20.00
Nickel	8.00	11.00
Molybdenum	--	0.75
Copper	--	0.75

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, pickled as required or passivated. Tubing shall have been cold finished sufficiently to ensure proper weld reinforcement height and roundness in the weld reinforcement area.

3.3 Fabrication

Tubing 2.00 inches (50.8 mm) and under in nominal OD shall be cold finished after welding to remove any dimensional indication of the presence of the weld. Surface finishing 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 and, if performed, the product shall be subsequently passivated.

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 specified in Table 2.

TABLE 2A - TENSILE PROPERTIES, INCH/POUND UNITS ¹

Nominal OD Inches	Nominal Wall Thickness Inch	Tensile Strength ksi	Elongation in 2 Inches % _{min} Strip	Elongation in 2 Inches % _{min} Full Tube
Up to 0.188, incl	Up to 0.016, incl	75 to 115	--	35
	Over 0.016	75 to 100	--	40
Over 0.188 to 0.500, incl	Up to 0.010, incl	75 to 110	32	37
	Over 0.010	75 to 100	35	40
Over 0.500	Up to 0.010, incl	75 to 100	27	32
	Over 0.010	75 to 100	30	35

1. Minimum tensile properties have been taken from ASTM A 249, and have not been substantiated using the procedures of SAE/AMS Metals Division.

TABLE 2B - TENSILE PROPERTIES, SI UNITS ¹

Nominal OD Millimeters	Nominal Wall Thickness Millimeters	Tensile Strength MPa	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 to 793	--	35
	Over 0.41	517 to 689	--	40
Over 4.78 to 12.70, incl	Up to 0.25, incl	517 to 758	32	37
	Over 0.25	517 to 689	35	40
Over 12.70	Up to 0.25, incl	517 to 689	27	32
	Over 0.25	517 to 689	30	35

1. Minimum tensile properties have been taken from ASTM A 249, and have not been substantiated using the procedures of SAE/AMS Metals Division.

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 - FLARABILITY, INCH/POUND UNITS

Nominal OD Inches	Expanded OD Inches	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 - 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 shown for the larger of the two sizes.

3.4.3 Susceptibility to Intergranular Attack

Specimens from tubing, as received, taken to include the weld, shall pass the copper/copper sulfate/sulfuric acid test of ASTM A 262, Practice E.

3.4.4 Pressure Test

Tubing shall show no bulges, leaks, pinholes, cracks, or other defects when subjected to an internal hydrostatic pressure, based on nominal dimensions, sufficient to cause a tensile stress of 20.0 ksi (138 MPa) in the tubing wall.

3.5 Quality

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 grease, oil and other foreign matter, 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.

3.5.1 If weld reinforcement is present at the welds on the inner surfaces of tubing over 2.00 inches (50.8 mm) in nominal OD, such weld reinforcement shall be not thicker than 0.010 inch (0.25 mm).

3.5.2 When specified by purchaser, tubing shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417 to ultrasonic inspection in accordance with AMS2634, to electromagnetic (eddy-current) inspection in accordance with ASTM E 426, or to any combination thereof. Tubing shall meet the requirements of 3.5 and other acceptance criteria established by the cognizant engineering organization (See 8.4).

3.6 Tolerances

Shall conform to all applicable requirements of AMS2243.

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 the performance of all required tests. Purchaser may perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.