

AEROSPACE MATERIAL SPECIFICATION

SAE AMS5966

REV. B

Issued 1997-04
Reaffirmed 2007-08
Revised 2013-07

Superseding AMS5966A

Nickel Alloy, Corrosion and Heat Resistant, Welding Wire
50Ni - 20Cr - 20Co - 5.9Mo - 2.2Ti - 0.45Al
Consumable Electrode or Vacuum Induction Melted
(Composition similar to UNS N07263)

RATIONALE

AMS5966B revises or incorporates standard industry requirements for winding (3.5.2.1), cast (3.5.2.2, Table 2) and helix (3.5.2.3, 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 nickel alloy in the form of welding wire.

1.2 Application

This wire has been used typically as filler metal for gas-tungsten-arc or gas-metal-arc welding of corrosion and heat-resistant nickel alloys of similar composition where the weld area is required to have strength and corrosion resistance comparable to those of the base metal, 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.

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.

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

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

AMS2813 Packaging and Marking of Packages of Welding Wire, Standard Method

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/AMS5966B>**

AMS2814	Packaging and Marking of Packages of Welding Wire, Premium Quality
AMS2816	Identification, Welding Wire, Tab Marking Method
AMS2819	Identification, Welding Wire, Direct Color Code System
ARP1876	Weldability Test for Weld Filler Metal Wire
ARP4926	Alloy Verification and Chemical Composition Inspection of Welding Wire

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 E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

3. TECHNICAL REQUIREMENTS

3.1 Wire Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 – COMPOSITION

Element	min	max
Carbon	0.04	0.08
Manganese	--	0.60
Silicon	--	0.40
Phosphorus	--	0.015
Sulfur	--	0.007
Chromium	19.00	21.00
Cobalt	19.00	21.00
Molybdenum	5.60	6.10
Titanium	1.90	2.40
Aluminum	0.30	0.60
Titanium + Aluminum	2.40	2.80
Iron	--	0.70
Boron	--	0.005
Copper	--	0.20
Lead	--	0.002
Bismuth	--	0.0001
Silver	--	0.0005
Nickel	remainder	

3.1.1 Chemical analysis of initial ingot, bar, or rod stock before drawing is acceptable provided the processes used for drawing or rolling, annealing, and cleaning are controlled to ensure continued conformance to composition requirements.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269. No variation over maximum is permitted for lead, bismuth, and silver.

3.2 Melting Practice

The alloy shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode melting is not performed in vacuum, electrodes which have been produced by vacuum induction melting shall be used.

3.3 Condition

Cold worked, bright finish, in a temper and with a surface finish which will provide proper feeding of the wire in machine welding equipment.

3.4 Fabrication

3.4.1 Wire shall be formed from rod or bar descaled by a process which does not affect the composition of the wire. Surface irregularities inherent with a forming process that does not tear the wire surface are acceptable provided the wire conforms to the tolerances of 3.6.

3.4.2 Butt welding is permissible provided both ends to be joined are alloy verified using a method capable of distinguishing the alloy from all other alloys processed in the facility, or the repair is made at the wire processing station. The butt weld shall not interfere with uniform, uninterrupted feeding of the wire in machine welding.

3.4.3 In-process annealing, if required, between cold rolling or drawing operations, shall be performed in vacuum or protective atmospheres to ensure freedom from the surface oxidation and absorption of other extraneous materials.

3.4.4 Residual elements, drawing compounds, oxides, dirt, oil, dissolved gasses and other foreign materials picked up during wire processing that can adversely affect the welding characteristics, the operation of the equipment, or the properties of the weld metal, shall be removed by cleaning processes that will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

3.5 Properties

Wire shall conform to the following requirements:

3.5.1 Weldability

Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds. ARP1876 may be used to resolve disputes.

3.5.2 Spooled Wire

Shall conform to 3.5.2.1, 3.5.2.2 and 3.5.2.3.

3.5.2.1 Winding

Filler metal in coils and on spools shall be wound so that kinks, waves, sharp bends, overlapping, or wedging are not encountered, leaving the filler metal free to unwind without restriction. The outside end of the electrode (the end where welding is to begin) shall be identified so it can be located readily and shall be fastened to avoid unwinding. The winding shall be level winding.

3.5.2.2 Cast

Wire, wound on standard diameter spools as shown in Table 2 shall have imparted to it a curvature such that a specimen sufficient in length to form one loop with a 1-inch (25-mm) overlap, when cut from the spool and laid on a flat surface, shall form a circle (cast) within the limits shown in Table 2.

3.5.2.3 Helix

The specimen on which cast was determined, when laid on a flat surface and measured between adjacent turns, shall show a vertical separation not greater than shown in Table 2.

TABLE 2A-CAST AND HELIX REQUIREMENTS – INCH-POUND UNITS

Spool Diameter, inches	Cast, inches		Helix, inches
	min	max	max
4	2.5	15	0.5
8	10	35	0.75
12	15	50	1

TABLE 2B-CAST AND HELIX REQUIREMENTS – SI UNITS

Spool Diameter, mm	Cast, mm		Helix, mm
	min	max	max
100	64	380	13
200	250	890	19
300	380	1270	25

3.6 Quality

Wire, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to welding operations, operation of welding equipment, or properties of the deposited weld metal.

3.7 Sizes and Tolerances

Wire shall be supplied in the sizes and to the tolerances shown in 3.7.1 and 3.7.2.

3.7.1 Diameter

Shall be as shown in Table 3.

TABLE 3A - SIZES AND DIAMETER TOLERANCES, INCH/POUND UNITS

Form	Nominal Diameter Inch	Tolerance	
		Inch Plus	Inch Minus
Cut Lengths	0.030, 0.035, 0.045	0.001	0.002
Cut Lengths	0.062, 0.078, 0.094, 0.125, 0.156, 0.187	0.002	0.002
Spools	0.007, 0.010, 0.015	0.0005	0.0005
Spools	0.020, 0.030, 0.035, 0.045, 0.062	0.001	0.002
Spools	0.078, 0.094	0.002	0.002