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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 6331A

Issued JUL 1991
Revised APR 1996

Superseding AMS **6331**

Submitted for recognition as an American National Standard

STEEL, WELDING WIRE
0.50Cr - 0.55Ni - 0.20Mo - (0.33 - 0.38C) (SAE 8735)
Vacuum Melted, Environment Controlled Packaging

UNS G87350

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of April 1996. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to the subject specification.

"NONCURRENT" refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, however, does not recommend these as standard materials for future use in new designs. Each of these "NONCURRENT" specifications is available from SAE upon request.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "E"

AN AMERICAN NATIONAL STANDARD

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REAFFIRMED
MAY 1995

1. SCOPE:

1.1 Form: This specification covers a low-alloy steel in the form of welding wire.

1.2 Application: Primarily for use as filler metal for gas-metal-arc or gas-tungsten-arc welding of steels of similar composition where the weld area is required to have strength and toughness comparable to those of the parent metal.

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 2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steel, Wrought Products Except Forgings and Forging Stock
AMS 2635 - Radiographic Inspection
AMS 2813 - Packaging of Welding Wire, Standard Method
AMS 2814 - Packaging of Welding Wire, Premium Quality
AMS 2815 - Identification, Welding Wire, Line Code System
AMS 2816 - Identification, Welding Wire, Color Code System
AMS 6357 - Steel Sheet, Strip, and Plate - 0.50Cr - 0.55Nl - 0.25Mo - (0.33 - 0.38C) (SAE 8735)
AMS 6358 - Steel Sheet, Strip, and Plate - 0.50Cr - 0.55Nl - 0.25Mo - (0.38 - 0.43C) (SAE 8740)

2.1.2 Aerospace Recommended Practices:

ARP1876 - Weldability Test for Weld Filler Metal Wire

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

ASTM E 8 - Tension Testing of Metallic Materials
ASTM E 8M - Tension Testing of Metallic Materials (Metric)
ASTM E 350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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	0.33 -	0.38
Manganese	0.75 -	1.00
Silicon	0.20 -	0.35
Phosphorus	- -	0.008
Sulfur	- -	0.008
Phosphorus + Sulfur		0.012
Chromium	0.40 -	0.60
Nickel	0.40 -	0.70
Molybdenum	0.15 -	0.25
Copper	- -	0.35
Oxygen (3.1.2)	- -	0.0025 (25 ppm)
Nitrogen (3.1.2)	- -	0.0050 (50 ppm)
Hydrogen (3.1.2)	- -	0.0010 (10 ppm)

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

3.1.2 Determination of oxygen, nitrogen, and hydrogen content not required for cut lengths.

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

3.2.1 Wire shall be furnished on disposable spools for machine welding and in cut lengths for manual welding, as ordered.

3.2.2 Drawing compounds, oxides, dirt, oil, and other foreign materials shall be removed by cleaning processes which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

3.2.3 Residual elements and dissolved gases deposited on, or absorbed by, the welding wire as a result of cleaning or cold working operations shall be removed by vacuum degassing.

3.2.4 Annealing, if required, shall be performed under vacuum or in an inert gas atmosphere.

3.3 Properties: Wire shall conform to the following requirements:

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

3.3.2 Spooled Wire: Shall conform to 3.3.2.1 and 3.3.2.2.

3.3.2.1 Cast: Wire, wound on standard 12-inch (305-mm) diameter spools, shall have imparted to it a curvature such that a specimen sufficient in length, 4 - 14 feet (1.2 - 4.3 m), to form one loop, when cut from the spool and laid on a flat surface, shall form a circle 15 - 50 inches (381 - 1270 mm) in diameter.

3.3.2.2 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 1 Inch (25 mm).

3.3.3 Tensile Properties: Specimens, prepared in accordance with 4.3.1 and tested in accordance with ASTM E 8 or ASTM E 8M, shall have average tensile strength not lower than 90% of the average of the control specimens of 4.3.1; elongation of the welded specimens shall be not less than 6% in 2 inches (50.8 mm).

3.4 Quality:

3.4.1 Steel shall be vacuum induction melted.

3.4.2 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.

3.5 Sizes and Tolerances: Wire shall be supplied in the sizes and to the tolerances shown in 3.5.1 and 3.5.2.

3.5.1 Diameter:

TABLE I

Form	Nominal Diameter Inch	Tolerance, Inch plus	minus
Cut Lengths	0.030, 0.045, 0.062, 0.078	0.002	0.002
Cut Lengths	0.094, 0.125, 0.156, 0.188	0.003	0.003
Spools	0.007, 0.010, 0.015, 0.020	0.0005	0.0005
Spools	0.030, 0.035, 0.045	0.001	0.002
Spools	0.062, 0.078, 0.094	0.002	0.002

TABLE I (SI)

Form	Nominal Diameter Millimeters	Tolerance, Millimeter plus	minus
Cut Lengths	0.76, 1.14, 1.57, 1.98	0.05	0.05
Cut Lengths	2.39, 3.18, 3.96, 4.78	0.08	0.08
Spools	0.18, 0.25, 0.38, 0.51	0.013	0.013
Spools	0.76, 0.89, 1.14	0.025	0.05
Spools	1.57, 1.98, 2.39	0.05	0.05

3.5.2 Length: Cut lengths shall be furnished in 18, 27, or 36 inch (457, 686, or 914 mm) lengths, as ordered and shall not vary more than +0, -0.5 inch (-13 mm) from the length ordered.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of wire 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 wire conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1), tensile properties (3.3.3), sizes and tolerances (3.5), and alloy verification (5.2.1) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests for weldability (3.3.1), cast (3.3.2.1), and helix (3.3.2.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing: Shall be in accordance with AMS 2370 and the following: