

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 6459B

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Superseding AMS 6459A

Submitted for recognition as an American National Standard

WIRE, STEEL WELDING
1.0Cr - 1.0Mo - 0.12V (0.18 - 0.23C)
Vacuum Induction Melted

UNS K22720

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 critical weldments of low-alloy steels requiring a weld joint capable of being heat treated to a strength approximating that of the parent metal.

- 1.3 Classification: Wire supplied to this specification is classified as follows:

Type I - Bare
Type II - Copper Coated

- 1.3.1 Type I shall be supplied unless Type II is specified.

- ## 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.

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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 Steels, Wrought Products Except Forgings and Forging Stock

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

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 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	0.18	0.23
Manganese	0.40	0.60
Silicon	0.60	0.90
Phosphorus	--	0.015
Sulfur	--	0.008
Chromium	0.80	1.20
Molybdenum	0.80	1.20
Vanadium	0.08	0.15
Copper	--	0.50
Oxygen (3.1.2)	--	0.0025 (25 ppm)
Nitrogen (3.1.2)	--	0.005 (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. No variation is permitted for oxygen, nitrogen, and hydrogen.

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

- 3.2 Condition: Cold drawn, bright finish, in a temper 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 or in cut lengths for manual welding, as ordered.
- 3.2.2 Drawing compounds, oxides, dirt, and oil 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 wire as a result of cleaning or drawing operations shall be removed by vacuum degassing. Annealing, if required, shall be performed under vacuum or in an inert gas atmosphere.
- 3.2.4 Type II wire shall be copper coated. The flash copper coating shall be clean, bright, and uniform in appearance. A maximum of 4 discontinuities per 36-inch (914-mm) length are acceptable in copper coating provided the exposed wire is clean and bright. The maximum allowable discontinuity size shall be 0.50 inch (12.7 mm) in length. The thickness of the coating shall not exceed 0.0005 inch (12.7 μ m) on the diameter.
- 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 weldability 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 (25.4 mm).
- 3.4 Quality:
- 3.4.1 Steel shall be vacuum induction melted; it may be remelted using consumable electrode vacuum process, but remelting is not required.
- 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, -1/2 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) and tolerances (3.5) 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.