SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 6460F

Issued 1954-11
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Superseding AMS 6460E

Wire, Steel Welding
0.75Si - 0.62Cr - 0.20Mo - 0.10Zr (0.10 - 0.17C)

(Composition similar to UNS K11365)

RATIONALE

AMS 6460F is a Five Year Review and update of this specification.

1. SCOPE:

1.1 Form:

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

1.2 Application:

This wire has been used typically as filler metal for gas-tungsten-arc and gas-metal-arc welding of low-alloy steels requiring a joint capable of being heat treated to strength levels consistent with the metals joined, but usage is not limited to such applications.

1.3 Classification:

Wire shall be classified as follows:

Type 1 - Bare Wire
Type 2 - Copper Coated

1.3.1 Type 1 shall be supplied unless Type 2 is permitted or required by purchaser.

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.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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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/AMS6460F

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS 2813	Packaging and Marking of Packages of Welding Wire, Standard Method
AMS 2816	Identification, Welding Wire, Tab Marking Method
AMS 2819	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, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

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:

Wire shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon (3.1.2)	0.10	0.17
Manganese	0.50	0.80
Silicon	0.60	0.90
Phosphorus	--	0.040
Sulfur	--	0.040
Chromium	0.50	0.75
Molybdenum	0.15	0.25
Zirconium	0.05	0.15
Nickel	--	0.25
Copper (3.1.2)	--	0.35

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

3.1.2 Shall be determined on finished wire for carbon, and on finished wire for copper if wire is supplied copper clad.

3.1.3 Chemical analysis of initial ingot, bar, or rod stock before drawing, other than those analyses required to be done on the finished wire, is acceptable provided the processes used for drawing or rolling, annealing, and cleaning are controlled to ensure continued conformance to chemical composition requirements.

3.2 Condition:

Cold drawn, bright finish, in a temper that will provide proper feeding of the wire in machine welding equipment.

3.3 Fabrication:

3.3.1 Wire shall be formed from rod or bar descaled by a process that 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.

3.3.2 Butt welding is permissible provided both ends to be joined are either alloy verified using a method capable of distinguishing the alloy from all others 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 equipment.

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

3.3.4 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.

3.3.5 When Type 2 copper coated wire is specified, the copper coating shall be clean, bright, and uniform in appearance. A maximum of four discontinuities in any 36 inch (91.4 mm) length are acceptable provided the exposed wire is clean and bright. The maximum allowable discontinuity size shall be 0.25 inch (6.25 mm) in length. The thickness of the copper coating shall not exceed 0.0005 inch (0.0127 mm) on the diameter.

3.4 Properties:

Wire shall conform to the following requirements:

3.4.1 Weldability: Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds, determined by a procedure agreed upon by purchaser and vendor. The referee method of ARP1876 may be used to resolve weldability disputes.

3.4.2 Spooled Wire: Shall conform to 3.4.2.1 and 3.4.2.2.

3.4.2.1 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 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 15 to 50 inches (381 to 762 mm) in diameter.

3.4.2.2 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).

3.5 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.

3.6 Sizes and Tolerances:

Wire shall be supplied in the sizes and to the tolerances shown in 3.6.1 and 3.6.2.

3.6.1 Diameter: Shall be as shown in Table 2.

TABLE 2A - Standard Diameters and Tolerances, Inch-Pound Units

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

TABLE 2B - Standard Diameters and Tolerances, SI Units

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

3.6.2 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 (+0, -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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1) and 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: Weldability (3.4.1), cast (3.4.2.1), and helix (3.4.2.2) 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 as specified herein.

4.4 Reports:

The vendor of wire shall furnish with each shipment a report showing the results of tests for the full composition of each heat, and for the carbon analysis and, if applicable, the copper analysis of each lot, and stating that the wire conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 6460F, nominal size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2370.

5. PREPARATION FOR DELIVERY:

5.1 Wire shall be supplied either on spools in one continuous length for machine welding or in cut lengths for manual welding, as ordered. Wire on each spool or in each package of cut lengths shall be from the same heat of steel.

5.2 Alloy Verification:

5.2.1 Wire from each spool or package of cut lengths shall be alloy verified by a method acceptable to purchaser and vendor. The alloy verification methods of ARP4926 are recommended.

5.2.2 An 8-inch (203-mm) length of wire shall be made accessible at both ends of each spool for alloy verification.