AEROSPACE MATERIAL SPECIFICATION

AMS6458™	REV. K

Issued 1960-06
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Superseding AMS6458J

Steel, Welding Wire
0.65Si - 1.25Cr - 0.50Mo - 0.30V (0.28 - 0.33C)
Vacuum Melted, Environment Controlled Packaging
(Composition similar to UNS K23015)

RATIONALE

AMS6458K results from a Five-Year Review and update of this specification revises form (1.1), application (1.2), and composition analytical testing methods (3.1); prohibits unauthorized exceptions (3.8); revises reporting (4.4) and identification (5.3); revises note 8.5; and adds notes 8.6 and 8.8.

1. SCOPE

1.1 Form

This specification covers a low-alloy steel in the form of bare welding wire. Type 2 - copper coated wire was removed from this document (see 8.5).

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 of similar composition where the weld area after heat treatment is required to have strength comparable to that of the parent 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2259 Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels

AMS2370 Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock

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

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS6458K

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

AMS6385 Steel Sheet, Strip, and Plate, Low-Alloy, Heat Resistant, 0.65Si - 1.25Cr - 0.50Mo - 0.25V (0.27 - 0.33C)

ARP1876 Weldability Test for Weld Filler Metal Wire

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

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 A370 Mechanical Testing of Steel Products

ASTM A751 Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

ASTM D2650 Chemical Composition of Gasses by Mass Spectroscopy

ASTM E1032 Radiographic Examination of Weldments Using Industrial X-Ray Film

3. TECHNICAL REQUIREMENTS

3.1 Composition

Wire shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751 or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Carbon (3.1.1.1)	0.28	0.33
Manganese	0.45	0.65
Silicon	0.55	0.75
Phosphorus	--	0.008
Sulfur	--	0.008
Chromium	1.15	1.35
Molybdenum	0.40	0.60
Vanadium	0.20	0.40
Nickel	--	0.25
Copper	--	0.35
Oxygen (3.1.1.1)	--	0.0025 (25 ppm)
Nitrogen (3.1.1.1)	--	0.005 (50 ppm)
Hydrogen (3.1.1.1)	--	0.0025 (25 ppm)

3.1.1 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 requirements.

3.1.1.1 Carbon, oxygen, nitrogen, and hydrogen shall be determined on each lot with carbon and hydrogen determined on finished wire. Hydrogen shall be determined in accordance with ASTM D2650.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259 except that no variation is permitted for oxygen, nitrogen, and hydrogen.

3.2 Melting Practice

Steel shall be multiple melted using vacuum consumable electrode process in the remelt cycle or shall be vacuum induction melted.

3.3 Condition

Cold worked, bright finish, in a temper and with a surface finish that 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 do not tear the wire surface are acceptable, provided the wire conforms to the tolerances of 3.7.

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

3.4.3 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.

3.4.4 Butt welding is permissible only at diameters larger than final finished product size provided both ends to be joined are either alloy verified using a method or methods 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.

3.4.5 Residual elements, drawing compounds, oxides, dirt, oil, dissolved gases, and other foreign materials picked up during wire processing shall be removed by cleaning processes that will neither result in pitting nor cause gas adsorption by the wire or deposition of substances harmful to the 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, determined by a procedure agreed upon by purchaser and producer. 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 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 (361 to 1270 mm) in diameter.

3.5.2.2 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).

3.5.2.3 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 wire (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.

3.5.3 Tensile Properties

Specimens, prepared in accordance with 4.3.1 and tested in accordance with ASTM A370, shall have average tensile strength not lower than 90% of the average of the control specimens of 4.3.1; elongation of the welded specimen shall be not less than 6% in 2 inches (50.8 mm).

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 standard sizes and to the tolerances shown in 3.7.1 and 3.7.2.

3.7.1 Diameter

Shall be as shown in Table 2.

Table 2A - Sizes and diameter tolerances, inch/pound units

Form	Nominal Diameter Inches	Tolerance Inches Plus and Minus
Cut Lengths	0.030, 0.045	0.001
Cut Lengths	0.062, 0.078	0.002
Cut Lengths	0.094, 0.125, 0.156, 0.188	0.002
Spools	0.007, 0.010, 0.015	0.0005
Spools	0.020, 0.030, 0.035, 0.045	0.001
Spools	0.062, 0.078, 0.094	0.002

Table 2B - Sizes and diameter tolerances, SI units

Form	Nominal Diameter Millimeters	Tolerance Millimeters Plus and Minus
Cut Lengths	0.76, 1.14	0.025
Cut Lengths	1.57, 1.98	0.05
Cut Lengths	2.39, 3.18, 3.96, 4.78	0.05
Spools	0.18, 0.25, 0.38	0.013
Spools	0.51, 0.76, 0.89, 1.14	0.025
Spools	1.57, 1.98, 2.39	0.05

3.7.2 Length

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

3.8 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of wire shall supply all samples for producer'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), sizes and tolerances (3.7), and alloy verification (5.2) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Weldability (3.5.1), cast (3.5.2.1), helix (3.5.2.2), and tensile properties (3.5.3) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2370 and as specified herein.

4.3.1 Specimens for Tensile Property Testing

A single-vee-groove, butt-joint weld shall be made between two pieces of AMS6385 or plate with a composition similar to UNS K23015, 0.250 inch (6.35 mm) in nominal thickness, which have been chamfered full depth to a 60 degree included angle; the weld shall be perpendicular to the longitudinal grain direction of the test pieces. Test pieces, prior to machining the test specimens, shall be heat treated to a tensile strength not lower than 180 ksi (1241 MPa). After heat treatment, the weld metal shall be finished flush with the parent metal on both faces and standard sheet-type, rectangular tensile specimens shall be prepared in accordance with ASTM A370, with the weld in the approximate center of the gage length. The weld in the specimens, prior to tensile testing, shall be free from defects detrimental to tensile properties of the weld, determined by radiographic inspection in accordance with ASTM E1032. Three control standard sheet-type, rectangular tensile specimens shall be machined from 0.250 inch (6.35 mm) AMS6385 or plate with a composition similar to UNS K23015 of the same heat of steel as that used for the welded specimens, heat treated with the welded specimens, and tested for comparative tensile properties in accordance with ASTM A370.

4.4 Reports

4.4.1 The producer of wire shall furnish with each shipment a report showing the results of tests for the full chemical composition of each heat, and for carbon, oxygen, nitrogen, and hydrogen contents 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, AMS6458K, nominal size, and quantity.

4.4.2 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS6458K(EXC) because of the following exceptions:" and the specific exceptions shall be listed (also see 5.3).

4.5 Resampling and Retesting

Shall be in accordance with AMS2370.