AEROSPACE MATERIAL SPECIFICATION

AMS5027™	REV. H

Issued 1970-05
Reaffirmed 2001-11
Revised 2023-10

Superseding AMS5027G

Steel, Welding Wire
1.05Cr - 0.55Ni - 1.0Mo - 0.08V (0.26 - 0.32C)
Vacuum Melted, Environment-Controlled Packaging
(Composition similar to UNS K22925)

RATIONALE

AMS5027H is the result of a Five-Year Review and update of the specification. The revision updates composition reporting (see 3.1.2), aligns wire size with industry standards (see Table 3A), prohibits unauthorized exceptions (see 3.8, 4.4.2, 5.3.1, and 8.4), and requires country of origin to be reported (see 4.4.1).

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 welding of heat-treatable steels of similar composition where the weld area is required to have strength comparable to that of the base metal after heat treating, 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

AMS2814 Packaging and Marking of Packages of Welding Wire, Premium Quality

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/AMS5027H/

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

AS7766 Terms Used in Aerospace Metals Specifications

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

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Wire Composition

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

Table 1 - Composition

Element	Min	Max
Carbon (3.1.1.1)	0.26	0.32
Manganese	0.60	0.90
Silicon	0.10	0.30
Phosphorus	--	0.010
Sulfur	--	0.010
Chromium	0.90	1.20
Nickel	0.40	0.70
Molybdenum	0.90	1.10
Vanadium	0.05	0.10
Copper (3.1.1.2)	--	0.35
Hydrogen (3.1.1.1)	--	0.0010 (10 ppm)
Oxygen (3.1.1.1)	--	0.0100 (100 ppm)
Nitrogen (3.1.1.1)	--	0.0050 (50 ppm)

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.

3.1.1.1 Carbon, oxygen, nitrogen, and hydrogen shall also be periodically determined on finished wire (see 4.2.2).

3.1.2 The producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection unless limits of acceptability are specified by the purchaser.

3.1.3 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259. No variation over maximum is permissible for oxygen, nitrogen, and hydrogen.

3.2 Melting Practice

Steel shall be vacuum induction melted or vacuum arc remelted, but remelting is not required.

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 that 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 tolerance of 3.7.

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

3.4.3 Butt welding is permissible provided both ends to be joined are either alloy verified using a method or methods 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.

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

3.4.5 Residual elements and dissolved gases picked up during wire processing that can adversely affect the welding characteristic, the operation of the equipment or the properties of the weld metal, shall be removed.

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 weldability disputes.

3.5.2 Spooled Wire

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	Wire Diameter Inches	Cast-Diameter Inches		Helix Inches
		Min	Max	Max
4	All	4	9	0.5
All other	≤0.030	12	n/a	1
	>0.030	15	n/a	1

Table 2B - Cast and helix requirements, SI units

Spool Diameter Millimeters	Wire Diameter Millimeters	Cast Diameter Millimeters		Helix Millimeters
		Min	Max	Max
102	All	100	230	13
All other	≤0.8	305	n/a	25
	>0.8	380	n/a	25

3.6 Quality

Wire, as received by the 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.

3.6.1 Surface irregularities inherent with a forming process that does not tear the wire surface are acceptable provided the wire conforms to the tolerances of 3.7.

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 Wire diameter and tolerance shall be as shown in Table 3.

Table 3A - Sizes and diameter tolerances, inch/pound units

Form	Standard Sizes Nominal Diameter Inches	Tolerance Inches Plus and Minus
Cut Lengths	0.030, 0.045	0.001
Cut Lengths	0.052, 0.062, 0.078, 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 3B - Sizes and diameter tolerances, SI units

Form	Standard Sizes Nominal Diameter Millimeters	Tolerance Millimeters Plus and Minus
Cut Lengths	0.76, 1.14	0.025
Cut Lengths	1.32, 1.57, 1.98, 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-, 27-, or 36-inch (457-, 686-, 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 the producer's tests and shall be responsible for the performance of all required tests. The 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 (see 3.1.1), sizes and tolerances (see 3.7), and alloy verification (see 5.2) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Determination of carbon, hydrogen, oxygen, nitrogen on finished wire (see 3.1.1.1), weldability (see 3.5.1), cast (see 3.5.2.2), and helix (see 3.5.2.3) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Sampling and testing shall be in accordance with AMS2370 and as specified herein:

4.4 Reports

4.4.1 The producer of wire shall furnish with each shipment a report showing the producer’s name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), the results of tests for composition of each heat, and stating that the wire conforms to the other technical requirements. This report shall include the purchase order number, heat, and lot numbers, AMS5027H, 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 AMS5027H(EXC) because of the following exceptions:” and the specific exceptions shall be listed (see 5.3.1).