AEROSPACE MATERIAL SPECIFICATION

AMS5790	REV. D

Issued 1984-10
Reaffirmed 2008-05
Revised 2014-02

Superseding AMS5790C

Steel, Corrosion and Heat-Resistant, Welding Wire
20Cr - 10Ni - 0.75Cb
High Ferrite Grade
(Composition similar to UNS S34780)

RATIONALE

AMS5790D results from a Five Year Review and update to revise reference to the DeLong Diagram (2.3, 3.1.3) and Reports (4.4).

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant steel in the form of welding wire.

1.2 Application

This wire has been used typically as filler metal for gas-tungsten-arc or gas-metal-arc welding of corrosion and heat-resistant alloys of similar composition, but usage is not limited to such applications.

1.2.1 The relatively high ferrite content promotes weldability by combating microfissuring and minimizing cracking in heavy sections but limits use of the wire to applications not operating in the sigma forming temperature range, approximately 1100 to 1600 °F (590 to 870 °C).

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 724-776-4970 (outside USA), www.sae.org.

AMS2248 Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

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**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5790D

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, 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

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

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 E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 AWS Publications

Available from American Welding Society, 8669 NW 36 Street, # 130 Miami, Florida 33166-6672 or www.aws.org.

DeLong, W. T. 1974. Ferrite in Austenitic Stainless Steel Weld Metal. Welding Journal 53(7): 273-s to 286-s.

3. TECHNICAL REQUIREMENTS

3.1 Wire Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 – COMPOSITION

Element	min	Max
Carbon (3.1.1.1)	--	0.05
Manganese	1.00	2.50
Silicon	0.30	0.65
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	18.50	21.00
Nickel	9.00	11.00
Columbium	10xC	0.80
Molybdenum	--	0.75
Tantalum	--	0.05
Copper	--	0.50
Nitrogen (3.1.1.1)	--	0.006 (60 ppm)

3.1.1 Chemical analysis of initial bar or rod stock before drawing is acceptable provided processes used for drawing or rolling, annealing, and cleaning are controlled to ensure continued conformance to composition requirements.

3.1.1.1 Carbon and nitrogen shall also be determined periodically on finished wire (See 4.2.2).

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.1.3 Ferrite Control

Ferrite number of the wire shall be not less than 5.0, based on the calculated ferrite content from the DeLong diagram (Reference: DeLong, W. T. 1974. Ferrite in Austenitic Stainless Steel Weld Metal. Welding Journal 53(7): 273-s to 286-s.

3.2 Condition

Cold worked, bright finish, in a temper and with a surface finish which 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 which does not affect the composition of the wire. Surface irregularities inherent with a forming process that does not tear the wire surfaces 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 alloy verified using a method capable of distinguishing the alloy from all other alloys processed within 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 in protective atmosphere to ensure freedom from surface oxidation and absorption of other extraneous elements.

3.3.4 Residual elements, drawing compounds, oxides, dirt, oil, dissolved gases, 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 which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

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 acceptable to purchaser. 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 circle15 to 50 inches (381 to 1270 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 - SIZES AND TOLERANCES, INCH/POUND UNITS

Form	Nominal Diameter Inch	Tolerance Inch Plus and Minus
Cut Lengths	0.030, 0.035, 0.045	0.001
Cut Lengths	0.062, 0.078, 0.094, 0.125, 0.156, 0.187	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 TOLERANCES, SI UNITS

Form	Nominal Diameter Millimeter	Tolerance Millimeter Plus and Minus
Cut Lengths	0.76, 0.89, 1.14	0.025
Cut Lengths	1.57, 1.98, 2.39, 3.18, 3.96, 4.75	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

3.6.2 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, -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 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 (3.1.1), ferrite number (3.1.3), sizes and tolerances (3.6), and alloy verification (5.2) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Determination of carbon and nitrogen on finished wire (3.1.1.1), 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 AMS2371 and as specified herein.