AEROSPACE MATERIAL SPECIFICATION

AMS5866™	REV. F

Issued 1989-07
Reaffirmed 2012-04
Revised 2022-07

Superseding AMS5866E

Steel, Corrosion-Resistant, Flat Wire 18Cr - 9.0Ni (302) Spring Temper

(Composition similar to UNS S30200)

RATIONALE

AMS5866F is the result of a Five-Year Review and update of the specification. The revision prohibits unauthorized exceptions (3.4, 3.7, 4.4.1, 5.1.1, 8.5), updates composition and reporting (3.1, 3.1.1), adds strain rate control (3.3.1.2), and allows prior revisions (8.4).

1. SCOPE

1.1 Form

This specification covers a corrosion-resistant steel in the form of flat wire 0.005 to 0.095 inch (0.13 to 2.41 mm) thick, inclusive.

1.2 Application

This wire has been used typically for retaining rings requiring corrosion- and heat-resistance up to 400 °F (204 °C) and which require moderate to severe forming and bending, but usage is not limited to such applications.

1.3 Classification

Wire covered by this specification is classified by edge configuration as follows:

Type 1 - Round edged wire

Type 2 - Square edged wire

1.3.1 Type 1 shall be supplied unless Type 2 is specified by purchaser (see 8.6).

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5866F/

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.

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

AMS2371 Quality Assurance Sampling and Testing, Corrosion- and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

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 A370 Mechanical Testing of Steel Products

ASTM A751 Chemical Analysis of Steel Products

ASTM E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 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 purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	--	0.15
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	17.00	19.00
Nickel	8.00	10.00
Molybdenum	--	0.75
Copper	--	0.75

3.1.1 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.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.2 Condition

Spring temper; cold drawn or rolled, descaled, and rerolled to required size.

3.3 Properties

Wire shall conform to the following requirements, determined in accordance with ASTM A370:

3.3.1 Tensile Properties

Square wire, and rectangular wire having nominal width not greater than ten times the nominal thickness, shall have tensile properties as shown in Table 2.

Table 2A - Tensile properties, inch/pound units (see Note)

Nominal Thickness Inches	Tensile Strength ksi	Elongation in 2 Inches %, min
0.005 to 0.022, incl	210 to 250	--
Over 0.022 to 0.047, incl	200 to 240	3
Over 0.047 to 0.062, incl	185 to 235	3
Over 0.062 to 0.074, incl	175 to 225	3
Over 0.074 to 0.089, incl	165 to 215	3
Over 0.089 to 0.095, incl	155 to 205	3

Table 2B - Tensile properties, SI units (see Note)

Nominal Thickness Millimeters	Tensile Strength MPa	Elongation in 50.8 mm %, min
0.13 to 0.56, incl	1448 to 1724	--
Over 0.56 to 1.19, incl	1379 to 1655	3
Over 1.19 to 1.57, incl	1276 to 1620	3
Over 1.57 to 1.88, incl	1207 to 1551	3
Over 1.88 to 2.26, incl	1138 to 1482	3
Over 2.26 to 2.41, incl	1069 to 1413	3

NOTE: Tensile properties for wire less than 0.008 inch (0.20 mm) have not been statistically substantiated in accordance with the SAE Aerospace Materials Systems Group policy.

3.3.1.1 The cross-sectional area of round edged wire (Type 1) shall be determined from measurements of thickness and width taken prior to the tensile test. The area on which stress is based, adjusted for rounded edges, shall be determined as shown in Equation 1.

$$A = T \times W - 0.12(T)^2 \quad \text{(Eq. 1)}$$

where:

A = area (for this test) or wire cross-section, square inches (mm^2)

T = thickness of wire specimen, inches (mm)

W = width of wire specimen, inches (mm)

3.3.1.2 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (0.002 mm/mm/min) through 0.2% offset yield strain. The strain rate after yield may be increased to any value up to 0.5 in/in/min (or 0.5 mm/mm/min) or equivalent crosshead speed as a function of gage length. The requirement for compliance becomes effective for material produced 1 year after the publication date of this document.

3.3.2 Hardness

Shall be as shown in Table 3, or equivalent (see 8.2). Product shall not be rejected on the basis of hardness if the tensile properties of 3.3.1 are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.

Table 3 - Hardness

Nominal Thickness Inches	Nominal Thickness Millimeters	Hardness
0.005 to 0.015, incl	0.13 to 0.38, incl	83.0 to 86.0 HR15N
Over 0.015 to 0.022, incl	Over 0.38 to 0.56, incl	64.0 to 69.5 HR30N
Over 0.022 to 0.047, incl	Over 0.56 to 1.19, incl	72.0 to 74.9 HRA
Over 0.047 to 0.062, incl	Over 1.19 to 1.57, incl	39.8 to 48.5 HRC
Over 0.062 to 0.074, incl	Over 1.57 to 1.88, incl	38.0 to 47.0 HRC
Over 0.074 to 0.089, incl	Over 1.88 to 2.26, incl	36.5 to 45.0 HRC
Over 0.089 to 0.095, incl	Over 2.26 to 2.41, incl	34.5 to 44.0 HRC

3.4 Mechanical property requirements for product outside the size range covered by Table 2 or 3 shall be agreed upon between purchaser and producer and reported per 4.4.1.

3.5 Quality

Wire, as received by purchaser, shall be uniform in quality and condition, sound, and free from pipes, seams, blisters, laminations, inclusions, and surface imperfections detrimental to usage of the wire.

3.5.1 Wire shall have a bright, smooth, cold drawn or rolled surface free from pits, abrasions, and other surface imperfections. Wire for coiling on automatic spring winding machines shall be furnished with a lubricating coating suitable for such purpose.

3.5.2 All welds made on coiled or spooled wire shall be marked and the method of marking shall be specified on the spool, label, or tag. Straightened or flattened cut lengths shall have no welds.

3.6 Dimensions and Tolerances

3.6.1 Edges

3.6.1.1 Type 1 wire shall have commercial round edges as shown in Figure 1 and maximum camber shall be 0.5 inch in 8 feet (12.7 mm in 2.4 m).

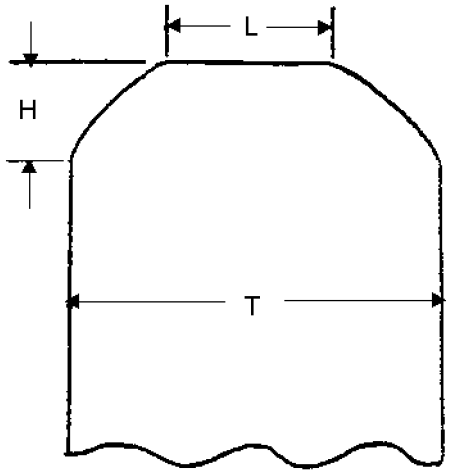

Figure 1 - Wire rounded edges

3.6.1.1.1 For wire thickness "T" 0.021 inch (0.53 mm) and under, the crown dimension "H" shall be 0.005 inch (0.13 mm) minimum and the maximum dimension "L" shall be 0.010 inch (0.25 mm) less than thickness "T."

3.6.1.1.2 For wire thickness "T" over 0.021 inch (0.53 mm), the crown dimension "H" shall be 0.0075 inch (0.190 mm) minimum and the maximum dimension of "L" shall be 0.020 inch (0.51 mm) less than thickness "T."

3.6.1.2 Type 2 wire shall have square edges, and maximum camber shall be 0.5 inch in 8 feet (12.7 mm in 2.4 m).

3.6.2 Thickness Tolerance

3.6.3 Shall be as shown in Table 4.

Table 4A - Thickness tolerance, inch/pound units

Thickness Inches	Tolerance, Inches Plus and Minus
Up to 0.010, incl	0.00035
Over 0.010 to 0.021, incl	0.0005
Over 0.021 to 0.045, incl	0.00075
Over 0.045 to 0.060, incl	0.0010
Over 0.060 to 0.089, incl	0.0015
Over 0.089	0.0020

Table 4B - Thickness tolerance, SI units

Thickness Millimeters	Tolerance, Millimeters Plus and Minus
Up to 0.25, incl	0.0089
Over 0.25 to 0.53, incl	0.013
Over 0.53 to 1.14, incl	0.0190
Over 1.14 to 1.52, incl	0.025
Over 1.52 to 2.26, incl	0.038
Over 2.26	0.051

3.6.4 Width Tolerance

3.6.5 Shall be as shown in Table 5.

Table 5A - Width tolerances, inch/pound units

Width Inches	Tolerance, Inches Plus	Tolerance, Inches Minus	Tolerance, Inches in 15 Continuous Feet
Up to 0.045, incl	0.002	0.002	0.001
Over 0.045 to 0.079, incl	0.003	0.002	0.001
Over 0.079 to 0.119, incl	0.004	0.003	0.001
Over 0.119 to 0.159, incl	0.005	0.003	0.001
Over 0.159 to 0.299, incl	0.005	0.004	0.0015
Over 0.299 to 0.499, incl	0.006	0.004	0.002
Over 0.499	0.007	0.005	0.002

Table 5B - Width tolerance, SI units

Width Millimeters	Tolerance, Millimeters Plus	Tolerance, Millimeters Minus	Tolerance, Millimeters in 4.6 Continuous Meters
Up to 1.14, incl	0.05	0.05	0.025
Over 1.14 to 2.01, incl	0.08	0.05	0.025
Over 2.01 to 3.02, incl	0.10	0.08	0.025
Over 3.02 to 4.04, incl	0.13	0.08	0.025
Over 4.04 to 7.59, incl	0.13	0.10	0.038
Over 7.59 to 12.67, incl	0.15	0.10	0.051
Over 12.67	0.18	0.13	0.051

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.

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

All technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing

Shall be in accordance with AMS2371.

4.4 Reports

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), and the results of tests for composition of each heat and for tensile properties and hardness of each lot. This report shall include the purchase order number, heat and lot numbers, AMS5866F, size, and quantity.