AEROSPACE MATERIAL SPECIFICATION

AMS5833	REV. D

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

Superseding AMS5833C

Cobalt Alloy, Corrosion and Heat-Resistant, Round Wire
20Cr - 15Ni - 40Co - 7.0Mo - 16Fe
Solution Heat Treated and Cold Drawn
(Composition similar to UNS R30003)

RATIONALE

AMS5833D results from a Five Year Review and update that revises Properties (3.5.3) and Reports (4.4).

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant cobalt alloy in the form of round wire 0.140 inch (3.56 mm) and under in nominal diameter supplied in straight lengths. (See 8.4.)

1.2 Application

This wire has been used typically for springs and torsion bars requiring a combination of high strength up to 800 °F (427 °C) after aging, excellent corrosion resistance, and good fatigue properties, but usage is not limited to such applications. The alloy is nonmagnetic.

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 supplied 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.

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys and Cobalt Alloys

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

AMS2750 Pyrometry

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/AMS5833D

AMS2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys

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 8/E 8M Tensile Testing of Metallic Materials

ASTM E 18 Rockwell Hardness of Metallic Materials

ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel and Cobalt Alloys

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 – COMPOSITION

Element	Min	max
Carbon	--	0.15
Manganese	1.5	2.5
Silicon	--	1.20
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	19.0	21.0
Nickel	14.0	16.0
Cobalt	39.0	41.0
Molybdenum	6.0	8.0
Beryllium	--	0.10
Other Elements, total	--	1.00
Iron	remainder	

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Melting Practice

The alloy shall be produced by multiple melting using vacuum induction followed by vacuum consumable electrode or electroslag remelting practices.

3.3 Condition

Solution heat treated and cold drawn.

3.4 Solution Heat Treatment

Wire shall be solution heat treated by heating to 2150 °F ± 25 (1177 °C ± 14), holding at heat for a time commensurate with section thickness, and cooling as required. Pyrometry shall be in accordance with AMS2750.

3.5 Properties

Wire shall conform to the following requirements:

3.5.1 As Solution Heat Treated and Cold Drawn:

3.5.1.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E 8/E 8M.

TABLE 2A - MINIMUM TENSILE STRENGTH, INCH/POUND UNITS

Specified Diameter Inch	Tensile Strength ksi
0.001 to 0.005, incl	260
Over 0.005 to 0.040, incl	240
Over 0.040 to 0.060, incl	235
Over 0.060 to 0.100, incl	225
Over 0.100 to 0.140, incl	220

TABLE 2B - MINIMUM TENSILE STRENGTH, SI UNITS

Specified Diameter Millimeters	Tensile Strength MPa
0.03 to 0.13, incl	1793
Over 0.13 to 1.02, incl	1655
Over 1.02 to 1.52, incl	1620
Over 1.52 to 2.54, incl	1551
Over 2.54 to 3.56, incl	1517

3.5.2 After Aging

Wire shall meet the requirements of 3.5.2.1 and 3.5.2.2 after being aged by heating to a temperature within the range 900 to 1000 °F (482 to 538 °C), holding at the selected temperature within ±25 °F (±14 °C) for 5 to 5-1/2 hours, and cooling to room temperature at a rate equivalent to air cool.

3.5.2.1 Tensile Properties

Shall be in accordance with Table 3, determined in accordance with ASTM E 8/E 8M.

TABLE 3A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Specified Diameter Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset, Ksi
0.001 to 0.005, incl	330	--
Over 0.005 to 0.040, incl	290	210
Over 0.040 to 0.060, incl	285	200
Over 0.060 to 0.080, incl	275	200
Over 0.080 to 0.100, incl	275	195
Over 0.100 to 0.120, incl	270	185
Over 0.120 to 0.140, incl	270	180

TABLE 3B - MINIMUM TENSILE PROPERTIES, SI UNITS

Specified Diameter Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset, MPa
0.03 to 0.13, incl	2275	--
Over 0.13 to 1.02, incl	1999	1448
Over 1.02 to 1.52, incl	1965	1379
Over 1.52 to 2.03, incl	1896	1379
Over 2.03 to 2.54, incl	1896	1344
Over 2.54 to 3.05, incl	1862	1276
Over 3.05 to 3.56, incl	1862	1241

3.5.3 Tensile property requirements for product outside of the range covered by 1.1 shall be agreed upon between purchaser and producer.

3.5.3.1 Hardness

Shall be not lower than 46 HRC, or equivalent (See 8.2), determined in accordance with ASTM E 18.

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 usage of the wire.

3.7 Tolerances

Shall be as follows:

3.7.1 Diameter

In accordance with Table 4.

TABLE 4A - DIAMETER TOLERANCES, INCH/POUND UNITS

Specified Diameter Inch	Tolerance, Inch, plus and minus
0.001 to 0.0028, excl	0.0001
0.0028 to 0.005, excl	0.00015
0.005 to 0.009, excl	0.0002
0.009 to 0.016, excl	0.00025
0.016 to 0.021, excl	0.00035
0.021 to 0.038, excl	0.00045
0.038 to 0.051, excl	0.00055
0.051 to 0.099, excl	0.00065
0.099 to 0.140, incl	0.0007

TABLE 4B - DIAMETER TOLERANCES, SI UNITS

Specified Diameter Millimeters	Tolerance, Millimeter, plus and minus
0.025 to 0.071, excl	0.0025
0.071 to 0.13, excl	0.0038
0.13 to 0.23, excl	0.005
0.23 to 0.41, excl	0.0064
0.41 to 0.53, excl	0.0089
0.53 to 0.97, excl	0.0114
0.97 to 1.30, excl	0.0140
1.30 to 2.51, excl	0.0165
2.51 to 3.56, incl	0.018