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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5833B

Issued OCT 1984
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Reaffirmed SEP 2000

Superseding AMS 5833A

Cobalt Alloy, Corrosion and Heat Resistant, Round Wire
20Cr - 15Ni - 40Co - 7.0Mo - 16Fe
Solution Heat Treated and Cold Drawn

UNS R30003

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.

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. Alloy is nonmagnetic.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2269	Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 8	Tensile Testing of Metallic Materials
ASTM E 8M	Tensile Testing of Metallic Materials (Metric)
ASTM E 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 354	Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel and Cobalt Alloys

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

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 requirements of AMS 2269.

3.2 Melting Practice:

Alloy shall be produced by multiple melting using vacuum induction followed by vacuum consumable electrode or electroslag melting 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.

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 specified in Table 2, determined in accordance with ASTM E 8 or ASTM 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 in air to room temperature.

3.5.2.1 Tensile Properties: Shall be in accordance with Table 3, determined in accordance with ASTM E 8 or ASTM 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

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

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

3.7.2 Out-of-Round: Wire shall not be out-of-round by more than one-half of the total tolerance shown in Table 4.

3.7.3 Straightness: Wire shall be of such straightness that the maximum curvature (depth of arc) shall not exceed 0.016 inch (0.41 mm) in any 6-inch (152-mm) length.