

AEROSPACE MATERIAL SPECIFICATION



AMS 5834B

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Superseding AMS 5834A

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

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), 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 2750	Pyrometry
AMS 2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys

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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, cold drawn, and aged.

3.4 Heat Treatment:

Wire shall be solution heat treated by heating to $2150^{\circ}\text{F} \pm 25$ ($1177^{\circ}\text{C} \pm 14$), holding at heat for a time commensurate with nominal diameter, and cooling as required. After cold drawing, the wire shall be aged by heating to a temperature within the range 900 to 1000°F (482 to 538°C), holding at the selected temperature within $\pm 25^{\circ}\text{F}$ ($\pm 14^{\circ}\text{C}$) for 5 to 5-1/2 hours, and cooling in air to room temperature. Pyrometry shall be in accordance with AMS 2750.

3.5 Properties:

Wire shall conform to the following requirements:

3.5.1 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	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 2B - Minimum Tensile Strength, 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 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 3.

TABLE 3A - 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 3B - 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 3.

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.

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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for 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 AMS 2371.

4.4 Reports:

The vendor of wire shall furnish with each shipment a report showing 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 number, AMS 5834B, size, and quantity.