

AEROSPACE MATERIAL SPECIFICATION



AMS 5876B

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Superseding AMS 5876A

Cobalt Alloy, Corrosion and Heat Resistant, Strip
20Cr - 15Ni - 40Co - 7.0Mo - 16Fe
Solution Heat Treated and Cold Rolled
Vacuum Induction Plus Vacuum Consumable Electrode Melted

UNS R30003

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant cobalt alloy in the form of strip 0.100 inch (2.54 mm) and under in specified thickness and 4.000 inches (101.60 mm) and under in specified width.

1.2 Application:

This strip has been used typically for springs 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 2750	Pyrometry
AMS 2807	Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

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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
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 rolled.

3.4 Solution Heat Treatment:

Strip 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 section thickness, and cooling as required. Pyrometry shall be in accordance with AMS 2750.

3.5 Properties:

Strip shall conform to the following requirements:

3.5.1 As Solution Heat Treated and Cold Rolled:

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 Thickness Inch			Tensile Strength ksi
Up	to 0.0043, incl		260
Over 0.0043	to 0.01875, incl		250
Over 0.01875	to 0.025, incl		240
Over 0.025	to 0.047, incl		220
Over 0.047	to 0.075, incl		180
Over 0.075	to 0.100, incl		130

TABLE 2B - Minimum Tensile Strength, SI Units

Specified Thickness Millimeters	Tensile Strength MPa
Up to 0.109, incl	1793
Over 0.109 to 0.4762, incl	1724
Over 0.4762 to 0.64, incl	1655
Over 0.64 to 1.19, incl	1517
Over 1.19 to 1.90, incl	1241
Over 1.90 to 2.54, incl	896

3.5.2 After Aging: Strip 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 850 to 950 °F (454 to 510 °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 as specified in Table 3, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Specified Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset, ksi	Elongation in 2 Inches %
Up to 0.0043, incl	325	250	-
Over 0.0043 to 0.01875, incl	315	225	-
Over 0.01875 to 0.025, incl	300	225	1
Over 0.025 to 0.047, incl	275	225	1
Over 0.047 to 0.075, incl	225	160	3
Over 0.075 to 0.100, incl	170	100	17

TABLE 3B - Minimum Tensile Properties, SI Units

Specified Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset, MPa	Elongation in 50.8 mm %
Up to 0.109, incl	2241	1724	-
Over 0.109 to 0.4762, incl	2172	1551	-
Over 0.4762 to 0.64, incl	2068	1551	1
Over 0.64 to 1.19, incl	1896	1551	1
Over 1.19 to 1.90, incl	1551	1103	3
Over 1.90 to 2.54, incl	1172	689	17

3.5.2.1.1 Elongation requirements do not apply to strip 0.01875 inch (0.4762 mm) and under in specified thickness.

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:

Strip, 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 strip.

3.7 Tolerances:

Width and thickness tolerances shall be in accordance with Table 4 and Table 5, respectively.

3.7.1 Width:

TABLE 4A - Width Tolerances, Inch/Pound Units

Specified Width Inches	Tolerance, Inch plus and minus
Up to 0.3755, incl	0.0030
Over 0.3755 to 0.4999, incl	0.0040
Over 0.4999 to 4.0000, incl	0.0050

TABLE 4B - Width Tolerances, SI Units

Specified Width Millimeters	Tolerance, Millimeter plus and minus
Up to 9.538, incl	0.076
Over 9.538 to 12.697, incl	0.102
Over 12.697 to 101.60, incl	0.127

3.7.2 Thickness:

TABLE 5A - Thickness Tolerances, Inch/Pound Units

Specified Thickness Inch	Tolerance, Inch plus and minus
0.001 to 0.002, incl	0.00015
Over 0.002 to 0.004, incl	0.0002
Over 0.004 to 0.006, incl	0.0003
Over 0.006 to 0.009, incl	0.0004
Over 0.009 to 0.012, incl	0.0005
Over 0.012 to 0.015, incl	0.00065
Over 0.015 to 0.020, incl	0.00075
Over 0.020 to 0.025, incl	0.0010
Over 0.025 to 0.030, incl	0.00125
Over 0.030 to 0.050, incl	0.0015
Over 0.050 to 0.070, incl	0.00175
Over 0.070 to 0.100, incl	0.002

TABLE 5B - Thickness Tolerances, SI Units

Specified Thickness Millimeters	Tolerance, Millimeter plus and minus
0.02 to 0.05, incl	0.0038
Over 0.05 to 0.10, incl	0.005
Over 0.10 to 0.15, incl	0.008
Over 0.15 to 0.23, incl	0.010
Over 0.23 to 0.30, incl	0.013
Over 0.30 to 0.38, incl	0.0165
Over 0.38 to 0.51, incl	0.0190
Over 0.51 to 0.64, incl	0.025
Over 0.64 to 0.76, incl	0.0318
Over 0.76 to 1.27, incl	0.038
Over 1.27 to 1.78, incl	0.0444
Over 1.78 to 2.54, incl	0.051

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of strip 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 strip 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 strip 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 5876B, size, and quantity.