SAE Aerospace
An SAE International Group

# AEROSPACE MATERIAL SPECIFICATION

SAE AMS5894 | REV. C

Issued 1993-01
Revised 2009-09

Superseding AMS5894B

## Cobalt Alloys, Bars, Sheet, and Plate
## 60Co – 28Cr – 4.5W – 1.15C
## Solution Heat Treated

RATIONALE

AMS5894C revises condition of sheet and plate (3.2.1), adds product form to the reporting requirements (4.4) and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a cobalt alloy in the form of sheet and plate up to 1 inch (25 mm) in nominal thickness or round bars up to 3 1/2 inches (89 mm) in nominal diameter.

1.2 Application

These products have been used typically for parts requiring wear resistance and minimum galling or seizing tendencies at room and elevated temperatures, but usage is not limited to such applications.

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 or Canada) or 724-776-4970 (outside USA), www.sae.org.

| | |
|---|---|
| AMS2261 | Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire |
| 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 |
| AMS2806 | Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys |
| AMS2807 | Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing |





**TO PLACE A DOCUMENT ORDER:** Tel: 877-606-7323 (inside USA and Canada)
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**http://www.sae.org/technical/standards/AMS5894C**

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

| | |
|---|---|
| ASTM A 480/A 480M | Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip |
| ASTM E 8/E 8M | Tension 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 | 0.90 | 1.40 |
| Manganese | 0.5 | 2.0 |
| Silicon | 0.2 | 2.0 |
| Phosphorus | -- | 0.04 |
| Sulfur | -- | 0.03 |
| Chromium | 28.00 | 32.00 |
| Tungsten | 3.50 | 5.50 |
| Nickel | -- | 3.0 |
| Molybdenum | -- | 1.50 |
| Iron | -- | 3.0 |
| Cobalt | remainder | |



3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet and Plate

Hot rolled, solution heat treated and descaled with a No. 1 finish appearance as described in ASTM A 480/A480M.

3.2.2 Bar

Solution heat treated with a turned or ground finish.

3.3 Solution Heat Treatment

The product shall be solution heat treated by heating to 2250 °F ± 25 (1232 °C ± 14), holding at heat for a time commensurate with cross-section but not less than 15 minutes, and cooling at a rate equivalent to a still air cool or faster. Pyrometry shall be in accordance with AMS2750.

3.4 Properties

The product shall conform to the following requirements:

3.4.1 Tensile Properties

Shall be shown in Table 2; determined in accordance with ASTM E 8/E 8M. Bars shall be tested in the longitudinal direction. Sheet and plate shall be tested in the transverse direction. Reduction in area is not applicable to plate or sheet under 0.5 inches (12.7 mm) in nominal thickness.

TABLE 2 - MINIMUM TENSILE PROPERTIES

| Property | Value |
|---|---|
| Tensile Strength | 130 ksi (896 MPa) |
| Yield Strength at 0.2% Offset | 70 ksi (483 MPa) |
| Elongation in 4D | 5% |
| Reduction of Area | 7% |

3.4.2 Hardness

Shall be 33 to 43 HRC, determined in accordance with ASTM E 18.

3.5 Quality

The product, 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 product.

3.6 Tolerances

Shall conform to all applicable requirements of the following:

3.6.1 Bars

Shall be in accordance with AMS2261.

3.6.2 Sheet and Plate

Not applicable unless separately agreed upon.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the product shall supply all samples for vendor'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 product 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 vendor of the product 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, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS5894C, product form, size, and quantity.

4.5 Resampling and Retesting

Shall be in accordance with AMS2371.

5. PREPARATION FOR DELIVERY

5.1 Identification

Shall be as follows:

5.1.1 Bars

In accordance with AMS2806.

5.1.2 Sheet and Plate

In accordance with AMS2807.

5.2 Packaging

The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Products not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES

8.1 A change bar (|) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

8.2 Terms used in AMS are clarified in ARP1917.

8.3 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.