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SAE-AMS5642, "STEEL, CORROSION AND HEAT RESISTANT, BARS, WIRE, AND FORGINGS 18 CR - 10.5NI - 0.60CB FREE-MACHINING, SOLUTION HEAT TREATED", was adopted on 10-JAN-94 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Commander, Defense Supply Center Philadelphia, ATTN: DSCP-ILEA, 700 Robbins Avenue, Philadelphia, PA 19111-5096. Copies of this document may be purchased from the Society of Automotive Engineers 400 Commonwealth Drive Warrendale, Pennsylvania, United States, 15096-0001. <http://www.sae.org/>

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# AEROSPACE MATERIAL SPECIFICATION



AMS 5642J

Issued SEP 1947  
Revised OCT 1993  
Reaffirmed AUG 2000

Superseding AMS 5642H

## Steel, Corrosion and Heat Resistant, Bars, Wire, and Forgings 18Cr - 10.5Ni - 0.60Cb Free-Machining, Solution Heat Treated

UNS S34720 (Type 1)  
UNS S34723 (Type 2)

### 1. SCOPE:

#### 1.1 Form:

This specification covers two types of free-machining, corrosion and heat resistant steel in the form of bars, wire, forgings, and forging stock.

#### 1.2 Application:

These products have been used typically for parts on which the amount of machining warrants the use of a free-machining grade of steel, requiring corrosion resistance similar to the 18-8 type of steel, and which will be subjected to high temperatures during fabrication or in service, except that it is not intended for parts to be brazed at temperatures higher than 1350 °F (732 °C) or to be fusion welded, but usage is not limited to such applications.

#### 1.3 Classification:

The steels covered by this specification are classified as follows:

Type 1 - 18Cr - 10.5Ni - 0.26S - 0.60Cb

Type 2 - 18Cr - 10.5Ni - 0.14P - 0.25Se - 0.60Cb

1.3.1 Unless a specific type is specified, either type may be supplied.

### 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 purchase order.

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## 2.1 SAE Publications:

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

AMS 2241	Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
MAM 2241	Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2248	Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2374	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steel and Alloy Forgings
AMS 2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS 2808	Identification, Forgings

## 2.2 ASTM Publications:

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

ASTM A 262	Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM A 370	Mechanical Testing of Steel Products
ASTM E 353	Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

## 2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services 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 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	Type 1 min	Type 1 max	Type 2 min	Type 2 max
Carbon	--	0.08	--	0.08
Manganese	--	2.00	--	2.00
Silicon	--	1.00	--	1.00
Phosphorus	--	0.040	0.11	0.17
Sulfur	0.18	0.35	--	0.030
Chromium	17.00	19.00	17.00	19.00
Nickel	9.00	12.00	9.00	12.00
Columbium	10 X C	1.10	10 x C	1.10
Selenium	--	--	0.15	0.35
Molybdenum	--	0.75	--	0.75
Tantalum (see 3.1.2)	--	0.05	--	0.05
Copper	--	0.75	--	0.75

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.1.2 Determination not required for routine acceptance.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Bars, Wire, and Forgings: Solution heat treated free from continuous carbide network and descaled.

3.2.1.1 Bars and Wire:

3.2.1.1.1 All hexagons, other bars 2.75 inches (69.8 mm) and under in nominal diameter or distance between parallel sides, and wire shall be cold finished.

3.2.1.1.2 Bars, other than hexagons, over 2.75 inches (69.8 mm) in nominal diameter or distance between parallel sides shall be hot finished.

3.2.2 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

Bars, wire, and forgings shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A 370. Properties of forging stock shall be as agreed upon by purchaser and vendor.

3.3.1 Tensile Properties: Wire shall have tensile strength not higher than 125 ksi (862 MPa).

3.3.2 Hardness:

3.3.2.1 Bars: Shall be as shown in Table 2, or equivalent (see 8.2), determined approximately at midradius.

TABLE 2 - Hardness

Nominal Diameter or Distance Between Parallel Sides Inches	Nominal Diameter or Distance Between Parallel Sides mm	Hardness
Up to 0.75, incl	Up to 19.0, incl	170 to 255 HB
Over 0.75	Over 19.0	140 to 241 HB

3.3.2.2 Forgings: Shall be not higher than 187 HB, or equivalent (see 8.2)

3.3.3 Susceptibility to Intergranular Attack: The product, after sensitizing treatment, shall pass the intergranular corrosion acid test performed in accordance with ASTM A 262, Practice E.

3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, sound, and consistent with the type of steel involved, free from foreign materials and from imperfections detrimental to usage of the product.

3.4.1 Grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow.

3.5 Tolerances:

Bars and wire shall conform to all applicable requirements of AMS 2241 or MAM 2241.

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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product 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 the following:

##### 4.3.1 Bars, Wire, and Forging Stock: AMS 2371

##### 4.3.2 Forgings: AMS 2374

#### 4.4 Reports:

4.4.1 The vendor of bars, wire, and forgings shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and the results of tests on each lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, heat and lot number, AMS 5642J, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of forging stock shall furnish with each shipment a report showing the results of tests for chemical composition of each heat. This report shall include the purchase order number, heat number, AMS 5642J, size, and quantity.

#### 4.5 Resampling and Retesting:

Shall be in accordance with the following:

##### 4.5.1 Bars, Wire, and Forging Stock: AMS 2371

##### 4.5.2 Forgings: AMS 2374

#### 5. PREPARATION FOR DELIVERY:

##### 5.1 Sizes:

Except when exact lengths or multiples of exact lengths are ordered, straight bars and wire will be acceptable in mill lengths of 6 to 20 feet (1.8 to 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

##### 5.2 Identification:

Shall be as follows: