Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE. WARRENDALE. PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5642G
Superseding AMS 5642F

Issued 9-1-47
Revised 7-1-76

UNS S34740 (Type 1)
UNS S34741 (Type 2)

STEEL BARS AND FORGINGS, CORROSION AND HEAT RESISTANT
18Cr - 10.5Ni - 0.60 (Cb + Ta) (303 + Cb)
Free-Machining

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: Primarily for parts on which the amount of machining warrants 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.

1.3 Classification: The steels covered by this specification are classified as follows:

Type 1 - 18Cr - 10.5Ni - 0.26S - (Cb + Ta).
Type 2 - 18Cr - 10.5Ni - 0.14P - 0.25Se - (Cb + Ta).

1.3.1 Unless a specific type is specified, either Type 1 or Type 2 may be supplied.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2241 - Tolerances, Corrosion and Heat Resistant Steel Bars and Wire and Titanium and Titanium Alloy Bars and Wire
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings
AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Heat and Corrosion Resistant Steels and Alloys
AMS 2808 - Identification, Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A262 - Detecting Susceptibility to Intergranular Attack in Stainless Steels
ASTM A370 - Mechanical Testing of Steel Products
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

Printed in U.S.A.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

ø

	Type 1		Type 2	
	min	max	min	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 + Tantalum	10 x C	1.10	10 x C	1.10
Selenium	--	--	0.15	0.35
Molybdenum	--	0.75	--	0.75
Copper	--	0.75	--	0.75

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

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.

3.2.1.1 Bars and Wire:

3.2.1.1.1 All hexagons, other bars 2.750 in. (69.85 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 2.750 in. (69.85 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: The product shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A370:

3.3.1 Tensile Properties: Wire shall have tensile strength not higher than 125,000 psi (862 MPa) or equivalent hardness.

3.3.2 Hardness:

3.3.2.1 Bars: Shall be as follows, or equivalent, determined approximately midway between outer surface and center:

Nominal Diameter or Distance Between Parallel Sides		Brinell Hardness	
Inches	(Millimetres)	min	max
Up to 0.75, incl	(Up to 19.05, incl)	170	255
Over 0.75	(Over 19.05)	140	241

3.3.2.2 Forgings: Shall be not higher than 187 HB or equivalent.

3.3.3 Embrittlement: The product, after sensitizing treatment, shall pass the copper/copper sulfate/sulfuric acid test performed in accordance with ASTM A262, Practice E, without evidence of intercrystalline ø surface attack. After exposure, specimens shall not crack when bent 180 deg (3.14 rad) around a diameter equal to the nominal thickness or diameter of the specimen.

3.4 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign ø materials, and, consistent with the type of steel involved, from internal and external imperfections detrimental to fabrication or to performance of parts.

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

3.6 Tolerances: Unless otherwise specified, tolerances for bars and wire shall conform to all applicable requirements of AMS 2241.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: The following are classified as acceptance or routine control tests:

4.2.1.1 Tests of the product to determine conformance to composition (3.1) requirements.

4.2.1.2 Tests of wire to determine conformance to tensile property (3.3.1) requirements.

4.2.1.3 Tests of bars, mechanical tubing, forgings, and flash welded rings to determine conformance to hardness (3.3.2) requirements.

4.2.1.4 Tests of bars, wire, and mechanical tubing to determine conformance to tolerance (3.6) requirements.

4.2.2 Qualification Tests: Tests to determine conformance to embrittlement requirements (3.3.3) are classified as qualification or periodic control tests.

4.2.2.1 For direct U.S. Military procurement, qualification test material and supporting test data shall be submitted to the cognizant qualification agency as directed by the request for procurement, the procuring activity, or the contracting officer.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Bars and Wire: AMS 2371.

4.3.2 Forgings and Forging Stock: As agreed upon by purchaser and vendor.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat in the shipment and for tensile properties and hardness of each size from each heat and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat. 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 finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Bars and Wire: In accordance with AMS 2806.

5.1.2 Forgings: In accordance with AMS 2808.

5.1.3 Forging Stock: As agreed upon by purchaser and vendor.

5.2 Packaging:

5.2.1 The product shall be prepared for shipment in accordance with commercial practice to ensure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.

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