



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 5656

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Revised

STEEL BARS, FORGINGS, AND RINGS, CORROSION RESISTANT 9.0Mn - 20Cr - 6.5Ni - 0.27N

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Bars, wire, forgings, extrusions, flash welded rings, and stock for forging or flash welded rings.
3. **APPLICATION:** Primarily for parts requiring high strength and corrosion resistance from -423 F (-253 C) up to 1100 F (593 C) and where parts require welding during fabrication.

4. **COMPOSITION:**

	min	max
Carbon	--	0.04
Manganese	8.00 -	10.00
Silicon	--	1.00
Phosphorus	--	0.060
Sulfur		0.030
Chromium	19.00 -	21.50
Nickel	5.50 -	7.50
Nitrogen	0.15 -	0.40

- 4.1 **Check Analysis:** Composition variations shall meet the requirements of the latest issue of AMS 2248.
5. **CONDITION:** Unless otherwise ordered, the product shall be supplied in the following condition:
 - 5.1 **Bars:** Hot rolled, solution heat treated as in 6.1.1, and descaled; round bars ground or turned.
 - 5.2 **Wire:** Cold finished and solution heat treated as in 6.1.1.
 - 5.3 **Forgings, Extrusions, and Flash Welded Rings:** Solution heat treated as in 6.1.1 and descaled.
 - 5.3.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, they shall be manufactured in accordance with the latest issue of AMS 7490, unless otherwise specified.
 - 5.4 **Stock for Forging or Flash Welded Rings:** As ordered by the forging or flash welded ring manufacturer.
6. **TECHNICAL REQUIREMENTS:** When ASTM methods are specified for determining conformance to the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.
 - 6.1 **Bars, Wire, Forgings, Extrusions, and Flash Welded Rings:**
 - 6.1.1 **Heat Treatment:** The product shall be solution treated by heating to 1950 F + 25 (1065.6 C + 14), holding at heat for a time commensurate with section thickness, and cooling at a rate equivalent to air cool or faster.

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- 6.1.2 Tensile Properties: Specimens taken from bars, wire, forgings, extrusions, and parent metal of flash welded rings shall conform to the following requirements:

Tensile Strength, psi	90,000 min
Yield Strength at 0.2% Offset or at 0.0075 in. in 2 in. Extension Under Load ($E = 28,800,000$), psi	50,000 min
Elongation, % in 2 in. or 4D	40 min

- 6.1.3 Hardness: Not higher than Rockwell B 100 or equivalent.

- 6.1.4 Embrittlement: Material from bars, forgings, extrusions, and flash welded rings shall be capable of meeting the following test:

- 6.1.4.1 Test specimens taken from these products shall be heated at $1250\text{ F} \pm 10$ ($676.7\text{ C} \pm 5.6$) for 1 hr and air cooled.

- 6.1.4.2 Test specimens shall be subjected to the acidified copper sulfate test specified in ASTM A393 without evidence of intercrystalline surface attack. After immersion the specimens shall withstand, without cracking, bending at room temperature under the conditions described in the ASTM standard.

7. QUALITY: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

8. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

- 8.1 Bars and Wire: The latest issue of AMS 2241.

- 8.2 Extrusions: As agreed upon by purchaser and vendor.

9. REPORTS:

- 9.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in each shipment and the results of tests on each size from each heat to determine conformance to the tensile property requirements of this specification. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat. If forgings are supplied, the part number and size of stock used to make the forgings shall also be included.

- 9.2 Unless otherwise specified, 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, 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.

10. IDENTIFICATION: Unless otherwise specified, the product shall be identified as follows:

- 10.1 Bars and Wire:

- 10.1.1 Each straight bar 0.500 in. and over in diameter or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than 3 ft with AMS 5656, heat number, and manufacturer's identification. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.