

MATERIAL SPECIFICATIONS

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STEEL BARS, FORGINGS, TUBING, AND RINGS,
CORROSION AND MODERATE HEAT RESISTANT
13Cr - 2Ni - 3W

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. FORM: Bars, forgings, mechanical tubing, flash welded rings, and stock for ϕ forgings or flash welded rings.
3. APPLICATION: Primarily for parts and assemblies, such as compressor wheels and blades, requiring oxidation resistance up to 1000 F (540 C). Strength at the higher temperatures is superior to that of the standard 12Cr type.
4. COMPOSITION:

Carbon	0.15 - 0.20
Manganese	0.50 max
Silicon	0.50 max
Phosphorus	0.040 max
Sulfur	0.030 max
Chromium	12.00 - 14.00
Nickel	1.80 - 2.20
Molybdenum	0.50 max
Tungsten	2.50 - 3.50
Aluminum	0.15 max
Copper	0.50 max
Tin	0.05 max

- 4.1 Check Analysis: Unless otherwise specified, composition variations shall meet the requirements of the latest issue of AMS 2248.
5. CONDITION: Unless otherwise specified, material shall be supplied in the following condition:
 - 5.1 Bars: All hexagons, and other bars 2.75 in. and under in diameter or distance between parallel sides shall be cold finished. All bars shall be annealed, in a machinable condition, having hardness not higher than Brinell 311 or equivalent.
 - 5.2 Mechanical Tubing: Cold finished, having hardness not higher than Brinell 311 or equivalent.
 - 5.3 Forgings: As ordered.
 - 5.4 Flash Welded Rings: Annealed, having hardness not higher than Brinell 311 or equivalent.
 - 5.4.1 Flash welded rings shall not be supplied unless specified on purchaser's part drawing. When supplied, they shall be manufactured in accordance with the latest issue of AMS 7493, unless otherwise specified.

5.5 Stock For Forgings or Flash Welded Rings: As ordered by the forging or flash welded ring manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Hardenability: Material 0.375 in. and less in thickness and 0.375 in. thick specimens cut from larger bars, tubes, forgings, and flash welded rings shall be capable of meeting the following test:

6.1.1 Specimens shall be placed in a furnace which is at 1750 F \pm 10 (954.4 C \pm 5.6), allowed to heat to 1750 F \pm 10 (954.4 C \pm 5.6), held at heat for 25 min., and quenched in commercial paraffin oil (approximately 100 SUS at 100 F (37.8 C)) at room temperature. Hardness of such specimens shall be not lower than Rockwell C 45.

7. QUALITY: Material 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: The latest issue of AMS 2241.

8.2 Tubing: The latest issue of AMS 2243.

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 the shipment. 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:

10.1 Bars and Tubing: Individual pieces or bundles shall have attached a metal or plastic tag embossed with the purchase order number, AMS 5616D, nominal size, and heat number, or shall be boxed and the box marked with the same information. In addition to the above identification, flats 2 x 1 in. and larger and other bars 1 in. and over in diameter or distance between parallel sides shall be stamped with the heat number within 2 in. of one end.

10.2 Forgings: Shall be identified in accordance with the latest issue of AMS 2808.

10.3 Flash Welded Rings: Shall be identified as agreed upon by purchaser and vendor.