# AEROSPACE
## MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York, N.Y. 10017

**AMS 5671**

Issued 9-1-65
Revised


# ALLOY FORGINGS AND RINGS, CORROSION AND HEAT RESISTANT
Nickel Base - 15.5Cr - 0.95(Cb + Ta) - 2.5Ti - 0.70Al - 7.0Fe
Consumable Electrode or Vacuum Induction Melted

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. FORM: Forgings, flash welded rings, and stock for forgings and flash welded rings.

3. APPLICATION: Primarily for parts, such as flanges, cases, and turbine rotors, requiring high strength at temperatures in the range of 800 - 1100 F (427 - 593 C), particularly where welding is involved.

4. COMPOSITION:

| | min | max |
|---|---|---|
| Carbon | -- | 0.08 |
| Manganese | -- | 0.35 |
| Silicon | -- | 0.35 |
| Phosphorus (1) | -- | 0.015 |
| Sulfur | -- | 0.010 |
| Chromium | 14.00 | 17.00 |
| Nickel + Cobalt | 70.00 | -- |
| Cobalt (1) | -- | 1.00 |
| Columbium + Tantalum | 0.70 | 1.20 |
| Titanium | 2.25 | 2.75 |
| Aluminum | 0.40 | 1.00 |
| Iron | 5.00 | 9.00 |
| Copper | -- | 0.50 |

(1) Determination not required for routine acceptance.

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2269.

5. CONDITION:

5.1 Forgings and Flash Welded Rings: Solution heat treated as in 6.1.1.

5.1.1 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. During manufacture of flash welded rings, the stock shall not be heated to a temperature higher than 1825 F (996 C), unless otherwise agreed upon by purchaser and vendor.

5.2 Stock for Forgings and Flash Welded Rings: As ordered by the forging or flash welded ring manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Forgings and Flash Welded Rings:

6.1.1 Heat Treatment: The product shall be solution heat treated by heating to 1800 F ± 25 (982.2 C ± 14), holding at heat for 1 hr, and cooling at a rate equivalent to air cool or faster.

6.1.2 Hardness: Shall be not higher than Brinell 320 or equivalent.

6.1.3 Properties After Precipitation Heat Treatment: The product shall conform to the following requirements after being precipitation heat treated by heating to 1350 F ± 15 (732.2 C ± 8.3), holding at heat for 8 hr, cooling at a rate of 100 F ± 15 (55.6 C ± 8.3) per hr to 1150 F ± 15 (621.1 C ± 8.3), holding at 1150 F ± 15 (621.1 C ± 8.3) per 8 hr, and air cooling.

Note. Instead of the 100 F (55.6 C) per hr cooling rate to 1150 F ± 15 (621.1 C ± 8.3), material may be furnace cooled at any rate provided the time at 1150 F ± 15 (621.1 C ± 8.3) is adjusted to give a total precipitation heat treatment time of 18 hours.

6.1.3.1 Tensile Properties:

6.1.3.1.1 Forgings Under 2.50 In. Thickness and Flash Welded Rings Under 2.50 In. Radial Thickness:

| Specimen Orientation | Tensile Strength psi, min | Yield Strength at 0.2% Offset or at Extension Indicated (E = 31,000,000) psi, min | Extension Under Load in. in 2 in. | Elongation % in 2 in. or 4D, min | Reduction of Area %, min |
|---|---|---|---|---|---|
| Longitudinal | 170,000 | 115,000 | 0.0114 | 18 | 25 |
| Transverse | 165,000 | 110,000 | 0.0111 | 15 | 15 |

6.1.3.1.2 Forgings 2.50 to 4.00 In., Excl, in Thickness and Flash Welded Rings 2.50 to 4.00 In., Excl, in Radial Thickness:

| Specimen Orientation | Tensile Strength psi, min | Yield Strength at 0.2% Offset or at Extension Indicated (E = 31,000,000) psi, min | Extension Under Load in. in 2 in. | Elongation % in 2 in. or 4D, min | Reduction of Area %, min |
|---|---|---|---|---|---|
| Longitudinal | 170,000 | 115,000 | 0.0114 | 15 | 20 |
| Transverse | 160,000 | 105,000 | 0.0108 | 12 | 12 |

6.1.3.2 Longitudinal property requirements of 6.1.3.1.1 and 6.1.3.1.2 apply to specimens taken with the axis approximately parallel to the grainflow, and to specimens taken in the radial direction and in the tangential direction at the rim of disc forgings. All other specimens shall be considered to be in the transverse direction.

6.1.3.3 Transverse test requirements of 6.1.3.1.1 and 6.1.3.1.2 apply to material having a cross section dimension sufficiently large to yield tensile test specimens not less than 2-1/2 in. long.

6.1.3.4 Specific locations of specimens shall be as agreed upon by purchaser and vendor.

6.1.3.5 Hardness: Rockwell C 32 - 42 or equivalent.

6.2 Stock for Forgings and Flash Welded Rings: When a sample of stock is forged to a test coupon and heat treated as in 6.1.1 and 6.1.3, specimens taken from the heat treated coupon shall conform to the requirements of 6.1.3.1 and 6.1.3.5. If specimens taken from the stock after heat treatment as in 6.1.1 and 6.1.3 conform to the requirements of 6.1.3.1 and 6.1.3.5, the test shall be accepted as equivalent to tests of the forged coupon.