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1-800-426-9794
PHONE 253-627-2910 / FAX 253-926-4660

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1-800-822-6358
PHONE 330-833-5800 / FAX 330-833-5815

LOS ANGELES, CALIFORNIA
1-800-624-8073
PHONE 323-588-2688 / FAX 323-588-1767

WINDSOR, CONNECTICUT
1-800-641-4140
PHONE 860-688-8393 / FAX 860-683-2337

WICHITA, KANSAS
1-800-426-9794
PHONE 316-838-7737 / FAX 316-821-9125

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EMAIL: SALES@SSA-CORP.COM

# 718 Nickel Alloy - Inconel® 718 - AMS 5662 - UNS N07718

Nickel Alloy 718, frequently called Inconel® 718, is a precipitation hardenable corrosion and heat-resistant nickel alloy available in bars, forgings, sheets and plates. AMS 5662 and AMS 5663 limit sizes 10” and less between parallel sides with maximum cross-section area of 78 $in^2$ for bars and finished forgings. It is a multiple melted alloy including VIM and/or VAR processes.

The alloy has high strength and creep rupture properties up from cryogenic temperatures to 1300° F, along with corrosion resistance and weldability with resistance to cracking. Nickel Alloy 718 has good resistance to oxidation and corrosion at temperatures and atmospheres in jet engine and gas turbine operations. It is also corrosion resistant to acids, sea water and sour oil and/or gas.

## 718 Nickel Applications:

Nickel Alloy 718 aerospace applications are jet engines, rocket motors, spacecraft, and fasteners. It is also used in oil and gas applications such as logging tools, pump shafts, fishing tools, and wellhead components.

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# Common Trade Names:

- Nickel 718
- Inconel® 718
- Alloy 718
- ATI 718
- ATI 718Plus®
- Pyrowear® 718
- Nicrofer 5219 Nb
- DIN 2.4668
- W-Nr 2.4668 (Werkstoff Number)

# Common Specifications:

- AMS 5662 Bars, Forgings, Rings
- AMS 5663 Bars, Forgings, Rings
- AMS 5664
- AMS 5596 Sheet, Plate, Strip
- AMS 5597 Sheet, Plate, Strip
- AMS 5441 718Plus® ATI
- ASTM B637
- ASME SB-637
- UNS N07718
- B50T69
- B50TF15
- C50TF13
- DMD 424.22
- EMS 55446
- EMS 55476
- EMS 52503
- NACE MR0175 (Oil & Gas)
- API 6A718 (Oil & Gas)
- ISO 9723

# Stocked Sizes:

- Rounds: Rough Turned, Solution Treated Condition (Annealed)
  - 38 Diameters 0.500" through 8"

# Physical Properties:

- Density: 0.296 #/in$^3$ Solution Treated condition (Annealed)
- Density: 0.297 #/in$^3$ Precipitation Hardened condition

# AS9100 Mill Producers:

- ATI Specialty Materials
- Carpenter Technology Corp
- Special Metals Corp
- VDM Metals USA

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# Fabrication

| | |
|---|---|
| Forging | 2050° F max for hot-working. Hot-cold working from 1700/1850° F |
| Machinability | Can be machined in either annealed or age-hardened condition |
| Welding | Weldable in either the annealed or age-hardened condition |

# Heat Treatment

| Type | Process |
|---|---|
| Solution Treatment | 1700°- 1850° then air cool |
| Precipitation Hardening | 1325° F for 8 hours, furnace cool to 1150° F |

# Chemical Composition:

| Symbol | Element | Min % | Max % |
|---|---|---|---|
| C | Carbon | - | 0.08% |
| Mn | Manganese | - | 0.35% |
| Si | Silicon | - | 0.35% |
| P | Phosphorus | - | 0.015% |
| S | Sulfur | - | 0.015% |
| Cr | Chromium | 17.00% | 21.00% |
| Ni | Nickel | 50.00% | 55.00% |
| Mo | Molybdenum | 2.80% | 3.30% |
| Cb (Nb) | Columbium (Niobium) | 4.75% | 5.50% |
| Ti | Titanium | 0.65% | 1.15% |
| Al | Aluminum | 0.20% | 0.80% |
| Co | Cobalt | - | 1.00% |
| B | Boron | - | 0.006% |
| Cu | Copper | - | 0.30% |
| Pb | Lead | - | 0.0005% (5 ppm) |
| Bi | Bismuth | - | 0.00003% (0.3 ppm) |
| Fe | Iron | remainder | - |

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# Minimum Tensile Properties at Room Temperature:

| Sample Orientation per Diameter or Least Distance between Parallel Sides | Tensile Strength | Yield Strength 0.2% Offset | Elongation in 4D | Reduction of Area |
|---|---|---|---|---|
| Longitudinal Size 10” and under | 185 ksi | 150 ksi | 12% | 15% |
| Long Transverse Forgings 5” and under | 180 ksi | 150 ksi | 10% | 12% |
| Long Transverse Forgings Over 5” & ≤ 10” | 180 ksi | 145 ksi | 10% | 12% |
| Transverse Bars 5” and under | 180 ksi | 150 ksi | 6% | 8% |
| Transverse Bars Over 5” & ≤ 10” | 180 ksi | 145 ksi | 6% | 8% |

* Precipitation Heat Treated per AMS 5662 Paragraph 3.5.1.2

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# Tensile Properties at 1200°F:

| Sample Orientation per Diameter or Least Distance between Parallel Sides | Tensile Strength | Yield Strength 0.2% Offset | Elongation in 4D | Reduction of Area |
|---|---|---|---|---|
| Longitudinal Size 5” and under | 145 ksi | 125 ksi | 12% | 15% |
| Longitudinal Size over 5% and ≤ 10” | 145 ksi | 122 ksi | 12% | 15% |
| Long Transverse Forgings 5” and under | 140 ksi | 125 ksi | 10% | 12% |
| Long Transverse Forgings Over 5” & ≤ 10” | 140 ksi | 122 ksi | 10% | 12% |
| Transverse Bars 5” and under | 140 ksi | 125 ksi | 6% | 8% |
| Transverse Bars Over 5” & ≤ 10” | 140 ksi | 122 ksi | 6% | 8% |

* Precipitation Heat Treated per AMS 5662 Paragraph 3.5.1.2
* Samples at 1200° F per AMS 5662 Paragraph 3.5.1.2.1.2