Technical Data Sheet
ATI 617™ Alloy

General Information

ATI 617™ alloy (UNS N06617) is a nickel-based superalloy with excellent creep-rupture strength and oxidation resistance at temperatures over 1800°F (980°C). Its high-temperature strength is realized by solid-solution strengthening from the molybdenum and cobalt additions, while chromium and aluminum additions impart its good cyclic oxidation and carburization resistance. ATI 617™ alloy is resistant to a variety of both reducing and oxidizing media.

ATI 617™ alloy is primarily used to manufacture combustion cans, inner housings, ducting, and transition liners for both aerospace and land-based gas turbines. The alloy has lower density than comparable high-temperature, tungsten-containing alloys of similar strength, resulting in an advantageous strength-to-weight ratio. Alloy 617™ is also used in the chemical processing industry and as components in both fossil-fueled and nuclear power-generating plants. It is currently under evaluation for helium-cooled reactor components. Alloy 617 is one of the few materials covered by the ASME Boiler and Pressure Vessel Code with design stresses up to 1800°F.

Forms and Conditions Available

The ATI 617™ alloy is available as plate, sheet, and strip. It is typically provided in the solution annealed condition.

The ATI 617™ alloy is covered by the AMS 5888 and 5889 specifications for plate and coil, respectively. ASTM B168 is an alternative specification cover plate, sheet, and strip product forms.

AMS 5888 and 5889 Specification Limits for UNS N06617 Composition	
Element	Weight Percent
Carbon	0.05 – 0.15
Manganese	0.50 max
Silicon	0.50 max
Phosphorus	0.015 max
Sulfur	0.015 max
Chromium	20.00 – 24.00
Cobalt	10.00 – 15.00
Molybdenum	8.00 – 10.00
Aluminum	0.80 – 1.50
Titanium	0.60 max
Boron	0.006 max
Iron	3.00 max
Copper	0.5 max
Nickel	Remainder

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Physical Properties

Density	0.302 lb/in³ (8.32 g/cm³)
Melting Range	2430 – 2510 °F (1330 – 1380 °C)
Electrical Resistivity	48.1 μΩ·in (122 μΩ·cm)
Thermal Conductivity	94 Btu·in/ft²·h·°F (13.4 W/m·K)
Specific Heat	0.100 Btu/lb·°F (419 J/kg·°C)
Coefficient of Thermal Expansion, RT – 200°F	7.0 × 10^{-6} in/in·°F (11.6 μm/m·°C)

Mechanical Properties

Typical room temperature mechanical properties of solution annealed ATI 617™ alloy exceed the minimum tensile property values listed in AMS5888 and AMS5889, which are listed in the table below.

Product Form	Tensile Strength (min.)		Yield Strength (min.)		Elongation (min.)
	ksi	MPa	ksi	MPa	%
AMS5889 (Coil)	100	689	40.0	276	40
AMS5888 (Plate, t ≤ 1.00 inch)	100	689	40.0	276	40
AMS5888 (Plate, 1.00 < t ≤ 2.00 inch)	95	655	35.0	241	35

Fabrication

Forming / Welding / Joining

ATI 617™ alloy is readily formed and welded by conventional techniques used for nickel alloys. The alloy has good fabricability, though it has a relatively high work hardening rate. The hot-forming characteristics of ATI 617™ alloy are similar to those of ATI 625™ alloy.

Heat Treatment

Solution annealing of ATI 617™ alloy is normally performed by heating in the range 2075 to 2200 °F, holding at the selected temperature for a time commensurate with cross-sectional thickness, and then cooling rapidly.