



## Alloy 36

**ASTM F1684 (96)/1.3981**

Alloy 36 possesses a low thermal expansion with high physical properties down to -250°C. This offers good weldability and permits economic cryogenic properties.

**Welding** – Conventional welding methods can be used with Alloy 36. Alloy 36 filler rod is recommended for those welds requiring filler rod.

**Working and Forming** – Alloy 36 may be worked using any conventional metal working method. Annealed material, that is material with an RB hardness of less than Rockwell B70, is desirable for material involving deep drawing, hydro-forming or spinning. For blanking, material between ¼ and ¾ hard will usually present a cleaner cut. Alloy 36 may be chemically etched. For operations where there is a large quantity of machining, Free Cutting Alloy 36 is available in round rod.

**Heat Treatment for Alloy 36** – Alloy 36 can be heat treated using one of the following methods, heating and cooling rates shall be controlled to prevent damage to the parts (cracking, warpage etc.):

1. **Annealing** – Heat parts to 821°C (±4°C) and hold at temperature one half hour per 25.4mm of thickness, then furnace cool at a rate not to exceed 92°C per hour to 312°C. No additional machining should be performed on these parts.
2. **Annealing plus Stabilisation**
  1. Rough machine
  2. Heat parts to 821°C (±4°C) and hold at temperature one half hour per 25.4mm of thickness, then furnace cool at a rate not to exceed 92°C per hour to 312°C. Still air cool is acceptable below 312°C.
  3. Semi finish machine.
  4. Heat parts for one hour at 312°C (±7°C) followed by air cooling.
  5. Heat parts for 48 hours at 95°C followed by air cooling
  6. Finish machine.
3. **Annealing plus Water Quench and Stabilisation**
  1. Rough machine.
  2. Heat parts to 821°C (±4°C) and hold at temperature one half hour per 25.4mm of thickness, then water quench.
  3. Semi finish machine.
  4. Heat parts for one hour at 312°C (±7°C) followed by air cooling.
  5. Finish machine.

Nominal Chemical Composition	
64% Fe	36% Ni

Mechanical Properties (typically annealed material)				
Hardness	Tensile Strength	Yield Strength	Elongation	Modulus of Elasticity
125HV	447Nmm <sup>2</sup>	278N/mm <sup>2</sup>	<45%	140-150GPa

Physical Properties		
Density	Curie Temperature	Melting Point
8.0 gcm <sup>-3</sup>	279°C	1427°C

Thermal Properties							
Coefficient of Expansion							
Temperature Range			x10K <sup>-1</sup>	Temperature Range			x10K <sup>-1</sup>
25°C	to	100°C	1.18	25°C	to	500°C	9.72
25°C	to	200°C	1.72	25°C	to	600°C	11.35
25°C	to	300°C	4.92	25°C	to	700°C	12.70
25°C	to	350°C	6.60	25°C	to	800°C	13.45
25°C	to	400°C	7.82	25°C	to	900°C	13.85
25°C	to	450°C	8.82				

Electrical Properties	
Electrical Resistivity	75-85 uOhm cm