

## Nilo 36 Invar 36 (UNS K93600)



Nilo 36 is made from a Nickel-Iron alloy containing 36% nickel and balance iron. It has almost constant coefficient of thermal expansion at the various temperature ranges. It offers minor room temperature coefficient of thermal expansion that makes Invar 36 purposeful in the aerospace engineering, measuring equipments, gauges, and pendulum and thermostat rods, pendulums, bimetallic strips and other electric transmission equipments.

### Chemical Composition

Iron (Fe)	Rem%
Nickel (Ni)	36 %
Cobalt (Co)	0.5 %
Carbon (C)	0.05 %
Silicon (Si)	0.40 %
Sulfur (S)	0.015 %
Chromium (Cr)	0.25%

### Physical Properties

Density	0.291 lb/cu in
Specific Gravity	8.05
Curie Temp	535oF or 279oC
Melting Point	2600oF or 1427oC
Electrical Resistivity	84 Micro-ohm-cm
	495 Micro-ohm-cm
Thermal Conductivity	0.10 W/cm oC
	72.6 BTU-in/sq. ft-hr
Specific Heat	0.123 Cal/g- oC
	0.123 BTU/lbm- oF
Thermal Expansion	4.9 ppm/oF at (75oF to 842oF
	8.9 ppm/oC at 25oC to 450oC)

### Mechanical Properties

Tensile Strength	75 ksi or 518 MPa
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Yield Strength	40 ksi or 276 MPa
Elongation	34 % in 2 inches
Hardness annealed	HRB 80 Rockwell
Modulus of Elasticity	20.5 MPsi or 141 kMPa

### Linear Coefficient of Thermal Expansion

Temperature, oC	Linear CTE
30 oC to 100 oC	0.8 to 1.6
30 oC to 150 oC	--
30 oC to 200 oC	1.3 to 2.1
30 oC to 250 oC	--
30 oC to 300 oC	4.92
30 oC to 325 oC	--
30 oC to 350 oC	6.2 to 7.0
30 oC to 375 oC	--
30 oC to 400 oC	7.8
30 oC to 425 oC	--
30 oC to 450 oC	8.5 to 9.2
30 oC to 475 oC	--
30 oC to 500 oC	9.7
30 oC to 525 oC	--
30 oC to 550 oC	--
30 oC to 600 oC	11.4
30 oC to 700 oC	12.7
30 oC to 800 oC	13.5
30 oC to 900 oC	13.9
30 oC to 1000 oC	--

### Machining

These alloys are machined preferably in the annealed condition by using the large speed steel / tungsten carbide tipped equipments. The cutting material is cutting oil or soluble oil dilution used for turning, drilling and milling of alloy. The dilution proportions are used for further machining processes. The below table shows the proportionate speed and feed rate:

	Cutting Speed	Feed
Rough turning, cutting depth (0.01-0.015 in/rev)	30-45 m/min	0.25-0.4 mm/rev
	(98-148 ft/min)	(0.01-0.015 in/rev)
Finish turning, cutting depth 0.125-0.25 mm (0.005-0.010 inch)	45-60 m/min or (148-197ft/min)	0.1-0.25 mm/rev or 0.1-0.25 mm/rev

### Available Forms

Wire, Sheet, Plate, Foil, Strip, Mesh