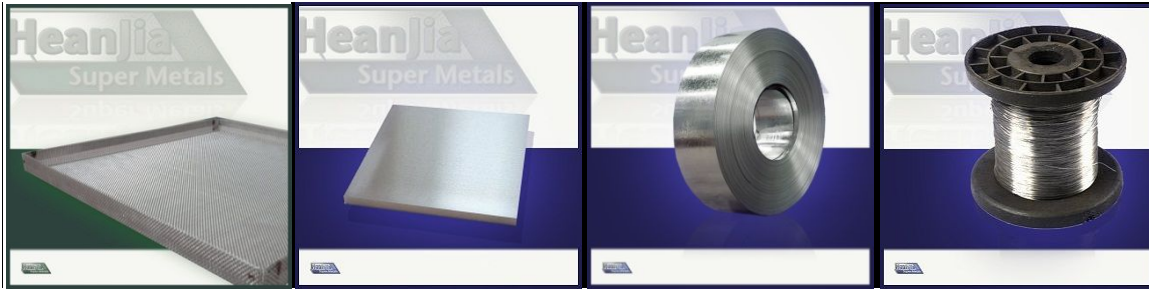


## Nilo 52 Invar 52 (UNS N14052)



Nilo 52 is a Nickel-Iron alloy, belongs to the family of low expansion alloys as it has stable coefficient of thermal expansion up to 1050of. High strength and hardness at the cryogenic temperature limits. It is referred as controlled expansion alloy with low coefficient of thermal expansion in the low and high temperature limits up to 565oC. It is hard and ductile and attains low dispersion. It is used in radar & microwave cavity resonating devices, shadow masks, electric gun modules, glass to metal sealing etc.

### Chemical Composition

Iron (Fe)	Rem %
Nickel (Ni)	50.5 %
Cobalt (Co)	-
Carbon (C)	0.05
Silicon (Si)	0.30
Sulfur (S)	0.025
Chromium (Cr)	0.025

### Physical Properties

Density	0.3 lb/cu-inch
Specific gravity	8.3
Curie temp	986 oF or 530 oC
Melting point	2600 oF or 1427 oC
Electrical resistivity	44 micro-ohm-cm
	258 ohm-cir mil/ft
Thermal conductivity	0.14 W/cm.oC or 97 BTU-inch/sq. ft-hr
Specific heat	0.12 Cal/g-oC or 0.12 BTU/lbm-oF
Thermal expansion	5.5 ppm/oF at 75oF to 842oF
	9.9 ppm/oC at 25oC to 450 oF

### Mechanical Properties

Tensile Strength	80 ksi or 552 MPa
Yield strength	40 ksi or 276 MPa
Elongation % in 2 inches	35

Tensile strength (Annealed)	450 to 550 N/mm <sup>2</sup> or 65 to 80 ksi
Service temperature (Annealed)	450 oC or 840 oF
Tensile strength (hard drawn)	700 to 900 N/mm <sup>2</sup> or 102 to 131 ksi
Service temperature (hard drawn)	450 oC or 840 oF

### Linear Coefficient of thermal expansion

Temperature, oC	Linear CTE
30 to100	10.5
30 to 150	10.5
30 to 200	10.4
30 to 250	10.4
30 to 300	10.2
30 to 325	-
30 to 350	10.2
30 to 375	-
30 to 400	10.1
30 to 425	-
30 to 450	9.6 to 10.7
30 to 475	10.1
30 to 500	10
30 to 525	10.4
30 to 550	10.2 to 10.7
30 to 600	10.8
30 to 700	11.7
30 to 800	12.5
30 to 900	13.3
30 to 1000	14.2

### Processing

Cold processing is not suitable for Nilo 52 alloy because it disturbs the coefficient of thermal expansion. Nilo 52 is annealed at temperature of 850oC to 1000oC.

The properties of processed of Nilo 52 alloy are shown as following:

Condition	Tensile Strength		Approx. service temperature	
Annealed	450 – 550 N/mm <sup>2</sup>	65 - 80 ksi	up to 450°C	up to 840°F
Hard Drawn	700 - 900 N/mm <sup>2</sup>	102 - 131 ksi	up to 450°C	up to 840°F

### Available Forms

Wire, Mesh, Strip, Sheet, Plate, Foil