

## Glass to Metal Sealing Nilo 42 Invar 42 (K94100)



Nilo 42 or Invar 42 offers almost stable coefficient of thermal expansion up to 570oF. It is durable and hard even at the ambient temperatures. Nilo 42 is used in clocks, electronic bulbs, glass to metal sealing and aerospace composites.

### Chemical Composition

Iron (Fe)	Rem %
Nickel (Ni)	41 %
Carbon (C)	0.05 %
Manganese (Mn)	0.80 %
Phosphorous (P)	0.025 %
Sulfur (S)	0.025 %
Silicon (Si)	0.030 %
Chromium (Cr)	0.250 %
Aluminum (Al)	0.10 %

### Physical Properties

Density	0.293 lb/cubic-inch
Specific Gravity	8.12
Curie temp	716 oF or 380 oC
Melting point	2600 oF or 1427 oC
Electrical resistivity	68 micro –ohm-cm or 400 ohm-cir mil/ft
Thermal conductivity	0.11 W/cm oC or 74.5 BTU-inch/sq. ft-hr
Specific heat	0.12 cal/g-oC or 0.12 BTU
Thermal expansion	3.9 ppm/of at 75oF to 842 oF or 7 ppm /oC at 25oC to 450 oF

### Mechanical Properties

Density	8.11 g/cc or 0.293 lb/in <sup>3</sup>
Ultimate Tensile Strength	490 Mpa or 71100 psi
	430 Mpa at 300oC or 62400 psi at 572oF
Yield Strength	250 Mpa at strain 0.20% or 36300 psi at strain 0.200 %

	120 Mpa at strain 0.200 % or 17400 psi at strain 0.200 %
Elongation	42 % at 300oC or 572oF
Linear Coefficient of thermal expansion	5.30 micro-m/mpC at 20 to 100oC or 2.94 micro-m/inch.oF at 68 to 212oF 4.50 to 6.50 micro-m/moC at 20 to 300oC or 2.50 to 3.61 micro-m/inch.oF from 68 to 572oF
Thermal conductivity	10.5 W/m-K or 72.9 BTU-in/hr-ft2-oF
Melting Point	1435oC or 2615oF

### Linear Coefficient of thermal expansion

30 oC to 100 oC	4.8 micro-m/oC
30 oC to 150 oC	4.6 micro-m/oC
530 oC to 200 oC	4.5 micro-m/oC
30 oC to 250 oC	4.5 micro-m/oC
30 oC to 300 oC	4 to 4.7 micro-m/oC
30 oC to 325 oC	4.7 micro-m/oC
30 oC to 350 oC	5 micro-m/oC
30 oC to 375 oC	5.5 micro-m/oC
30 oC to 400 oC	6 micro-m/oC
30 oC to 425 oC	-
30 oC to 450 oC	6.7 to 7.4 micro-m/oC
30 oC to 475 oC	-
30 oC to 500 oC	8 micro-m/oC
30 oC to 525 oC	-
30 oC to 550 oC	8.8 micro-m/oC
30 oC to 600 oC	9.5 micro-m/oC
30 oC to 700 oC	10.5 micro-m/oC
30 oC to 800 oC	11.4 micro-m/oC
30 oC to 900 oC	12.3 micro-m/oC
30 oC to 1000 oC	13.2 micro-m/oC

### Effect of Temperature

The temperature plays wide role in altering the magnetic properties of Nilo alloy such as the coercive force and residual induction regularly decrease with an increase in temperature without variation in the phase.

It might be noted that hysteresis loop for alloy decreases with rise in temperature.

Moreover the fabrication influences the magnetic features.

These are shown in the below table:

Heat Processing	Initial Permeability
1 hr. 800°C. 60°C/hr. Furnace cool to Room Temp	800
1 hr. 900°C. 60°C/hr. Furnace cool to Room Temp.	900
1 hr. 1000°C. 60°C/hr. Furnace cool to Room Temp	800
1 hr. 1100°C. 60°C/hr. Furnace cool to Room Temp.	800
4 hr. 1100°C. 60°C/hr. Furnace cool to Room Temp.	500
1 hr. 1200°C. 60°C/hr. Furnace cool to Room Temp.	500

## Available Forms

Wire, strip, foil, plate, sheet, mesh