



**ED FAGAN INC.**

# Invar 36<sup>1</sup> Controlled Expansion Alloys



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## DESCRIPTION

A low expansion alloy, consisting of 36% Nickel, balance Iron. This alloy exhibits extremely low expansion around ambient temperatures and is often used where minimum expansion is required.

## APPLICATIONS

Optoelectronics, optical and laser benches, electronics, and scientific instruments.

AKA: Invar 36<sup>1</sup>, Pernifer 36<sup>2</sup>, NILO 36<sup>4</sup>, Invar<sup>3</sup>

Footnotes: 1. Trademark Carpenter Technology Corp., Reading PA; 2. Trademark ThyssenKrupp-VDM, Germany; 3. Trademark Imphy Alloys, France; 4. Trademark Special Metals Corporation, USA



## PHYSICAL PROPERTIES

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

## MECHANICAL PROPERTIES

Tensile Strength	ksi	75
	MPa	518
Yield Strength	ksi	40
	MPa	276
Elongation	% in 2 in.	34
Typical Hardness Ann.	Rockwell	HRB 80
Modulus of Elasticity	Mpsi	20.5
	kMPa	141

## CHEMISTRY - maximum % unless noted

Iron	Bal	Silicon	0.40
Nominal Nickel	36	Sulfur	0.015
Nominal Cobalt	0.5	Chromium	0.25
Carbon	0.05		

## SPECIFICATIONS

ASTM	F-1684
MIL	I-23011 CI 7
AMS	I-23011 CI 7



## LINEAR COEFFICIENT OF THERMAL EXPANSION - (ppm per °C) Deg. °C Class 1

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

## FORMS AVAILABLE

Rod	3.175mm - 152.40mm	Coil/Strip*
Sheet	0.762mm - 31.750mm	Photo-Etch*
Plate	3.810mm - 101.60mm	

\*Though not a standard stock item, we may be able to supply you with the exact size, shape & quantities you require. Please call.



Ed Fagan Inc also specializes in locating exotic materials. So, if you can't locate that hard-to-find material you need... Put EFI's material locator service to work for you!

[www.Material-locator.com](http://www.Material-locator.com)

**THE MATERIALS YOU NEED,  
WHEN YOU NEED THEM**



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## Glass Sealing/ Controlled Expansion Alloys

EFI provides the highest quality materials including materials from Carpenter Technology Corp.

### ASTM F15 Alloy:

aka Kovar & Pernifer 2918  
Coil/Strip, Sheet, Plate,  
Bar, Wire

### Invar 36:

Bar, Sheet, Plate

### 42/46/48/52 Alloy:

Coil/Strip, Sheet, Plate, Bar

### Electronic Nickel

### 200/201/233/270:

Coil/Strip, Rod, Sheet, Plate

## Soft Magnetic Alloys/ EMI Shielding & Laminations

EFI is a distributor of magnetic shielding alloys for the world's leading producer of these alloys – ThyssenKrupp VDM.

### EFI Alloy 79: aka Magnifer 7904,

Moly-Permalloy & HyMu 80  
Sheet, Coil/Strip

### EFI 50:

aka Magnifer 50 & High Perm 49  
Bar, Coil/Strip

### Carpenter VimVar Core Iron:

Rod, Bar

### Carpenter Hiperco 50:

Coil/Strip, Billet

**Radiometal 4550:** Rod, Coil/Strip

## Refractory Metals/Alloys

EFI is a stocking distributor of Molybdenum & Tungsten products, as well as many other refractory metals and alloys, providing the highest quality materials available.

### Molybdenum:

Bar, Sheet, Plate, Coil/Strip

### TZM Molybdenum Alloy:

Sheet, Bar

### Tungsten:

Bar, Coil/Strip, Sheet

**Tantalum:** Sheet, Tubing

**Niobium:** Strip

**Tungsten Alloy:** Rod, Shapes

**Rhenium:** Sheet

## Hard-to-Find Special Purpose Metals, Alloys and Materials

Are you spending too much of your valuable time trying to locate suppliers of specialty metals and materials? Use EFI's Material Locator (see below) to source it for you so you can get back to doing what you do best.

- Coil/Strip
- Sheet
- Plate
- Rod
- Tube
- Pipe
- Wire

## JUST IN TIME DELIVERY

All standard stock items can be **shipped within 24 hours** – and are often **shipped the same day**. All materials are certified with shipment.

## METALS WE DISTRIBUTE

Titanium  
Zirconium

High Temperature Alloys  
Corrosion Resistant Alloys  
Stainless Steel

Copper – OFE, OFHC  
Brass & Bronze  
Beryllium Copper

## SERVICES WE OFFER

Slitting, Shearing, Saw Cutting, Centerless Grinding, Water-jet Cutting, Laser Cutting,  
Custom Stocking Programs • Consignment Programs



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