



ED FAGAN INC.

Alloy ASTM F-15 aka Kovar¹ Controlled Expansion Alloys



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DESCRIPTION

ASTM F-15 Alloy is a controlled expansion alloy consisting of 29% Nickel, 17% Cobalt, and balance Iron. It is produced to ensure good properties for machining and deep drawing as well as porosity free product. Its expansion characteristics match both borosilicate (Pyrex) glasses and alumina ceramics. It is one of the most popular of the controlled expansion alloys for hermetic sealing.

APPLICATIONS

Power tubes, microwave tubes, transistors, diodes, and hybrid packages.

AKA: Kovar¹, Pernifer 2918², Dilvar P1³, Rodar¹, NILO K⁴

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

PHYSICAL PROPERTIES

Density	<i>lb/cu in</i>	0.302
Specific Gravity		8.36
Curie Temp	<i>°F</i>	815
	<i>°C</i>	435
Melting Point	<i>°F</i>	2640
	<i>°C</i>	1449
Electrical Resistivity	<i>micro-ohm-cm</i>	49
	<i>ohm-cir mil/ft</i>	294
Thermal Conductivity	<i>W/cm °C</i>	0.17
	<i>BTU-in/sq. ft-hr-°F</i>	120
Specific Heat	<i>Cal/g-°C</i>	0.11
	<i>BTU-lbm-°F</i>	0.11
Thermal Expansion	<i>ppm/°F(75°F to 842°F)</i>	2.9
	<i>ppm/°C(25°C to 450°C)</i>	5.3

MECHANICAL PROPERTIES

Tensile Strength	<i>ksi</i>	75
	<i>MPa</i>	518
Yield Strength	<i>ksi</i>	40
	<i>MPa</i>	276
Elongation	<i>% in 2 in.</i>	30
Typical Hardness Ann.	<i>Rockwell</i>	HRB 80
Modulus of Elasticity	<i>Mpsi</i>	30
	<i>kMPa</i>	207

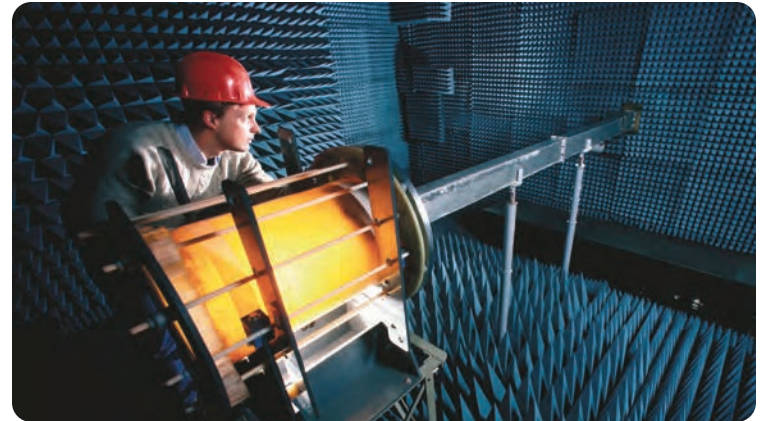
CHEMISTRY - maximum % unless noted

Iron Bal		Carbon	0.02
Nominal Nickel	29	Silicon	0.20
Nominal Cobalt	17	Chromium	0.20

FORMS AVAILABLE

Rod	0.050" - 6.00"	Coil/Strip	0.004" - 0.070"
Sheet	0.005" - 0.125"	Photo-Etch	0.004" - 0.020"
Plate	0.187" - 1.00"		

If you do not see the size or form you require listed above, please call us. We add new stock material frequently, and may have the size and form you need.



SPECIFICATIONS

ASTM F-15/F-1466 **AMS I-23011 CI 1**
MIL I-23011 CI 1

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

30-100	-	30-375	-	30-550	-
30-150	-	30-400	<u>4.6-5.2</u>	30-600	7.9
30-200	5.5	30-425	-	30-700	9.3
30-250	-	30-450	<u>5.1-5.5</u>	30-800	10.4
30-300	5.1	30-475	-	30-900	11.5
30-325	-	30-500	6.2	30-1000	-
30-350	-	30-525	-		

Underscored face values are the limits specified in MIL-I-23011C



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WHEN YOU NEED THEM**



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efi
ED FAGAN INC.

Glass Sealing / Controlled Expansion Alloys / Electrical & Electronic Nickel

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

ASTM F15 Alloy:

aka Kovar, Pernifer 2918, NILO K & Dilvar P1

Coil/Strip, Sheet, Plate, Round Bar

Invar 36:

aka Pernifer 36, NILO 36 & Invar Steel

Round Bar, Sheet, Plate

Super Invar 32-5:

Round bar, Sheet, Plate

42/*46/48/52 Alloy:

aka Pernifer 40, 46, 48 & 50;

NILO 42, 46, 48 & 50;

Glass Seal 42, 46, 48 & 50

Coil/Strip, Sheet, Plate, Round Bar

Electronic Nickel

200/201/233/270:

Coil/Strip, Round Bar, Sheet

**Products listed in Italics are special order and not standard stock items. Please call for availability.*

Soft Magnetic Alloys/ EMI Shielding & Laminations

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

EFI Alloy 79:

aka Magnifer 7904, Moly-Permalloy,

HyMu 80, Hypernom & Permalloy 80

Round Bar, Sheet, Coil/Strip

EFI Alloy 50:

aka Magnifer 50, High Permeability 49 & Alloy 47-50

Round & Square Bar, Coil/Strip

Carpenter VimVar Core Iron:

Round Bar

Carpenter Hiperco 50:

Plate, Coil/Strip

Carpenter Hiperco 50A:

Round Bar

Radiometal 4550:

Round Bar, 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:

Round Bar, Sheet, Plate,

Threaded Rod & Nuts

**Foil/Coil/Strip, Wire*

TZM Molybdenum Alloy:

Round Bar, Sheet, Plate

Tungsten:

Round Bar, Plate, **Sheet, *Wire*

Tungsten Alloy:

Round Bar, **Sheet, *Plate,*

**Shapes, *Flat Blanks*

**Tantalum: Round Bar, Sheet*

**Niobium: Foil/Coil/Strip*

**Rhenium: Sheet*

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METALS WE DISTRIBUTE

Titanium - CP & 6Al-4V • High Temperature Alloys • Corrosion Resistant Alloys • Stainless Steel

JUST IN TIME DELIVERY: All **standard stock** items can be **shipped within 24 hours** – and are often **shipped the same day**. For **special order** materials, EFI has long relationships with the manufacturers of these materials, so please contact a sales rep to discuss price and delivery options. All materials can be certified with shipment.

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