



ED FAGAN INC.

Alloy ASTM F-15 aka Kovar 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, NILO K⁴

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

PHYSICAL PROPERTIES

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

MECHANICAL PROPERTIES

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

CHEMISTRY - maximum % unless noted

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

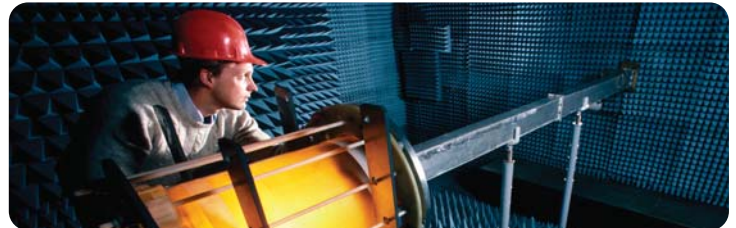
FORMS AVAILABLE

Rod	1.270mm - 152.40mm
Sheet	0.254mm - 3.175mm
Plate	4.165mm - 25.40mm
Strip/Coil - Annealed	0.127mm - 1.524mm
Strip/Coil - Tempered	0.254mm - 0.381mm

*Photo Etch

Strip/Coil can be slit to customer requirements down to 4mm widths.

*Please call for sizes and quantity requirements for a material price quote.



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



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ED FAGAN INC.

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
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