



ED FAGAN INC.

Alloy ASTM F-15 aka Kovar Controlled Expansion Alloys



769 Susquehanna Avenue, Franklin Lakes, NJ 07417 • **phone 201.891.4003**
10537 Humbolt Street, Los Alamitos, CA 90720 • **phone 562.431.2568**

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 ThyssenKrupp-VDM 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

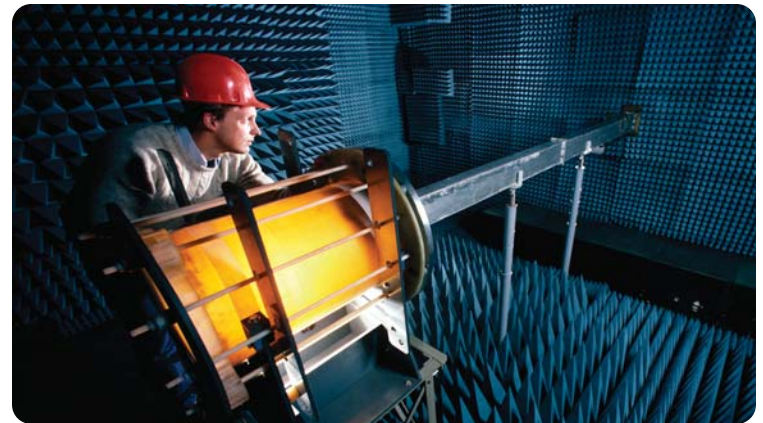
FORMS AVAILABLE

Rod	.040" - 6"	Coil/Strip	.004" - .070"
Sheet	.010" - .125"	Photo-Etch	.040" - .020"
Plate	.150" - 2"		



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



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

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



toll free 800.348.6268
www.edfagan.com
sales@edfagan.com
international sales
+44 (0) 1548 858 770

efi
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 Hipercro 50:

Coil/Strip, Billet

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

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



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

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



toll free 800.348.6268
www.edfagan.com
sales@edfagan.com
international sales
+44 (0) 1548 858 770

efi
ED FAGAN INC.