**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, Rodar⁴, NILO K⁴

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

**PHYSICAL PROPERTIES**

- **Density** : 0.302 lb/cu in
- **Specific Gravity** : 8.36
- **Curie Temp**: °F 815, °C 435
- **Melting Point**: °F 2640, °C 1449
- **Electrical Resistivity**: micro-ohm-cm 49, ohm-cm/in/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**

- **Iron Bal**
- **Nominal Nickel** : 29
- **Nominal Cobalt** : 17
- **Carbon** : 0.02
- **Silicon** : 0.20
- **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.

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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!

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: aka Invar 36, Pernifer 36, NILO 36 & Invar Steel
Round Bar, Sheet, Plate

42/42-6/46/48/52 Alloy: aka Pernifer 40, 46, 48 & 50;
NILO 42, 46, 48 & 50;
Glass Seal 42, 42-6, 46, 48 & 50
Coil/Strip, Sheet, Plate, Round Bar

Electronic Nickel
200/201/233/270:
Coil/Strip, Round Bar, Sheet

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, Hypermom & 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 50/50A:
Round & Square Bar, Coil/Strip

Radiometal 4550:
Round Bar, Coil/Strip

Refractory Metals/Alloys
EFI is a 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,
Foil/Coil/Strip, *Wire,
Threaded Rod & Nuts

TZM Molybdenum Alloy:
Round Bar, Sheet, Plate

Tungsten:
Round Bar, Plate, *Sheet, *Wire

*Tantalum:
Round Bar, Sheet

*Niobium:
Foil/Coil/Strip

Tungsten Alloy:
Round Bar, *Sheet, *Plate,
*Shapes, *Flat Blanks

*Rhenium: Sheet

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

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.

SERVICES WE OFFER
Slitting, Shearing, Saw Cutting, Centerless Grinding, Water-jet Cutting, Laser Cutting,
Custom Stocking Programs, Consignment Programs

Are you spending too much of your valuable time trying to locate specialty metals and materials? If you can’t locate the hard-to-find materials you need, use EFI’s Material Locator to source them for you.

www.material-locator.com