

26

Fe
55.845

Kovar® | ASTM F15

Controlled Expansion Alloys

Iron

28

Ni
58.6934

Co
58.933194

Nickel

Cobalt

DESCRIPTION

Kovar® | ASTM F15 is a vacuum melted, iron-nickel, low expansion alloy consisting of 29% Nickel, 17% Cobalt and balance Iron. Kovar's coefficient of thermal expansion characteristics match both borosilicate (Pyrex®) glasses and alumina ceramics making this alloy a desirable choice for sealing metal to glass parts. It is one of the most popular of the controlled expansion alloys for hermetic sealing and is also known as Pernifer® 2918, Dilver® P1, NILO® K.

APPLICATIONS

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

TYPICAL PHYSICAL PROPERTIES

Density	lb/cu in	0.302
Specific Gravity		8.36
Curie Temp	°F	815
	°C	435
Melting Point	°F	2640
	°C	1450
Electrical Resistivity (70°F)	ohm-cir mil/ft	294
	microhm-cm	49
Thermal Conductivity	BTU-in/sq.ft-hr°F	120
	W/cm °C	0.17
Specific Heat	Cal/gm°C	0.11
	BTU-lbm-°F	0.11

Source: CarTech® Kovar Alloy Data Sheet v.10/90. | ASTM F15

FORMS | SIZES AVAILABLE

Round Bar Rod	0.040" - 7.25"
Photo-Etch Strip Coil	0.010" - 0.015"
Plate	0.187" - 1.50"
Sheet	0.010" - 0.125"
Strip Coil	0.005" - 0.060"

Listed above are our standard stock items. Our inventory fluctuates based on market demands. If you do not see the size or form you require, please call us.

TYPICAL MECHANICAL PROPERTIES

*Tensile Strength	ksi (MPa)	75 (517)
**Sheet + Strip	ksi (MPa)	82 (570) max
**Rod + Wire	ksi (MPa)	85 (585) max
*Yield Strength	ksi (MPa)	50 (345)
*Elongation	% in 2"	30
*Typical Hardness Ann.	Rockwell B	68
Modulus of Elasticity	ksi (GPa)	20,000 (138)
Poisson's Ratio		0.317

*Kovar strip tested parallel to the direction of rolling. Material annealed 1830 °F (999°C) for 30 minutes, then furnace cooled.** Per ASTM F15, Temper A, Annealed

Source: CarTech® Kovar Alloy Data Sheet v.10/90. | ASTM F15

MEAN COEFFICIENT OF THERMAL EXPANSION AS ANNEALED

Temp Range 77°F to	Coefficient 10 ⁻⁶ /°F	Temp Range 25°C to	Coefficient 10 ⁻⁶ /°C	ASTM F15 CTE * 30°C to μm/m · °C
212°F	3.25	100°C	5.86	
392°F	2.89	200°C	5.20	
572°F	2.85	300°C	5.13	
662°F	2.72	350°C	4.89	
752°F	2.81	400°C	5.06	400°C 4.60 to 5.20
842°F	2.92	450°C	5.25	450°C 5.10 to 5.50
932°F	3.41	500°C	6.15	
1112°F	4.34	600°C	7.80	
1292°F	5.06	700°C	9.12	
1472°F	5.73	800°C	10.31	
1652°F	6.25	900°C	11.26	

Average coefficient of expansion properties after annealing in hydrogen for one hour at 1650°F (900°C) at 15 minutes 2010°F (1099°C) and cooled to room temperature within one hour.

Source: CarTech® Kovar Alloy Data Sheet v.10/90. | ASTM F15 Table 4

CHEMISTRY %

Nominal Nickel 29, Nominal Cobalt 17, Nominal Iron 53



Need pricing? We're here to help:
sales@efineametals.com
1.800.348.6268

SPECIFICATIONS

ASTM F15 UNS K94610 AMS I-23011 CL1 MIL I-23011 CL1

California Offices

10537 Humboldt Street, Los Alamitos, CA 90720
1847 W. Business Center Drive, Orange, CA 92867

New Jersey Offices

769 Susquehanna Avenue, Franklin Lakes, NJ 07417
3 Fir Court, Oakland, NJ 07436

Special Purpose Alloys & Metals From Stock



JUST-IN-TIME DELIVERY: All of our **standard stock** items can be **shipped within 24-hours** of your order confirmation and most are **shipped the same day**. All materials certified with shipment. For special orders and non-stock materials, contact our sales team for our competitive pricing and delivery lead times.

Controlled Expansion I Glass Sealing

EFINEA supplies the highest quality metals and alloys including materials from Carpenter Technology Corp.

Kovar® I ASTM F15® Alloy

Forms: Plate, Round Bar/Rod, Sheet, Strip/Coil
Trade Names: Kovar®, Pernifer® 2918, NILO K®, DilverP1®

Alloy 42/46/48/52

Forms: Plate, Round Bar/Rod, Sheet, Strip/Coil
Trade Names: Pernifer® 40, 46, 48, 50; NILO® 42, 46, 48, 50;
Glass Sealing 42, 46, 48, 52

Free-Cut Invar "36"® Alloy

Forms: Round Bar/Rod

Invar "36"® Alloy

Forms: Plate, Sheet
Trade Names: Pernifer® 36, NILO® 36, Invar

Super Invar 32-5®

Forms: Plate, Round Bar/Rod, Sheet

Electrical & Electronic Nickels

EFINEA supplies select, commercially pure grades of Nickel in various forms and sizes.

Electronic Nickels

200/201/205/233/270

Forms: Round Bar/Rod, Sheet, Strip/Coil, Wire

Refractory Metals and Alloys

EFINEA is your leading source for quality refractory metals & alloys. We stock DFARS Molybdenum, ML/MLS/MLR, Molybdenum TZM, Tantalum & Tungsten manufactured from Plansee.

Molybdenum

Forms: Plate, Round Bar/Rod, Sheet/Coiled Sheet, Threaded Rod/Nuts, Wire

Molybdenum Lanthanum Oxide (ML)

Forms: Sheet – Stress Relieved, Recrystallized

Molybdenum TZM

Forms: Plate, Round Bar/Rod, Sheet

Niobium

Forms: Plate, Round Bar/Rod, Sheet, Strip/Coil, Wire

Rhenium

Forms: Plate, Round Bar/Rod, Sheet, Strip/Coil

Tantalum

Forms: Plate, Round Bar/Rod, Sheet, Strip/Coil, Wire

Tungsten

Forms: Plate, Precision Cut Wire, Round Bar/Rod, Sheet

Tungsten Alloys

Forms: Blanks, Flats, Parts, Plate/Sheet, Rod, Shapes

Soft Magnetic Alloys I EMI Shielding & Laminations

EFINEA is a distributor of "EMI shielding alloys" for VDM Metals GmbH the world's leading producer of these alloys.

EFINEA Alloy 50

Forms: Round Bar/Rod, Square Bar, Strip/Coil, Wire Rod
Trade Names: High Permeability 49®, Magnifer® 50

EFINEA Alloy 79

Forms: Rectangular Bar, Round Bar/Rod, Sheet, Strip/Coil

Trade Names: Hipernom, HyMu80

Magnifer® 7904, Molypermalloy, Permalloy 80®

Hiperco® 50

Forms: Strip/Coil

Hiperco® 50A

Forms: Plate, Round Bar/Rod, Strip/Coil

Hiperco® 50 HS

Forms: Strip/Coil

Carpenter VimVar Core Iron

Forms: Round Bar/Rod

Allied pure Iron

Forms: Round Bar/Rod

Copper Metals

EFINEA supplies select, commercially pure grades of Copper available in Coil form.

Copper OFHC 101/102

Nickel-Silver 770

Cupro-Nickel 715 (CuNi 70/30)

Forms: Coil

Alloys and Metals We Distribute

Corrosion Resistant Alloys · High-Temperature Alloys
Stainless Steel · Titanium – CP, 6 Al-4V

EFINEA Services

Slitting, Shearing, Saw Cutting,
Grinding, Water Jet Cutting, Laser Cutting,
Custom Stocking and Consignment Programs



New Jersey Offices

769 Susquehanna Avenue, Franklin Lakes, NJ 07417
3 Fir Court, Oakland, NJ 07436

Need pricing? We're here to help:
sales@efineametals.com
1.800.348.6268

California Offices

10537 Humboldt Street, Los Alamitos, CA 90720
1847 W. Business Center Drive, Orange, CA 92867