



26

Fe
55.845

Alloy 46

Controlled Expansion Alloys

Iron

Ni
58.6934

Nickel

DESCRIPTION

A nickel-iron controlled expansion alloy used in a wide variety of applications that require glass and ceramic seals. Alloy 46 chemistry contains 46% Nickel with the balance Iron. This alloy is also known by their manufacturer's trade name of Pernifer[®] 46 and Carpenter Glass Sealing[®] 46.

APPLICATIONS

Metal-to-glass seals for electronic tubes and hermetic devices.

TYPICAL PHYSICAL PROPERTIES

| | | |
|------------------------|--------------------|-------|
| Density | lb/cu in | 0.295 |
| Specific Gravity | | 8.17 |
| Curie Temp | °F | 860 |
| | °C | 460 |
| Melting Point | °F | 2600 |
| | °C | 1427 |
| Electrical Resistivity | ohm-cir mil/ft | 277 |
| | microhm-cm | 47 |
| Thermal Conductivity | BTU-in/sq.ft-hr-°F | 79.2 |
| | W/cm °C | 0.11 |
| Specific Heat | Cal/g°C | 0.12 |

Source: ASTM International F30-96 (2017) | Efi Glass-to-metal sealing/Low expansion alloys data sheet v.1/98.

FORMS | SIZES AVAILABLE

| | |
|-----------------|----------------|
| Plate (Forged) | 0.1875" and up |
| Round Bar Rod | 0.250" and up |
| Sheet | Call for sizes |

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) | 80 (552) |
| Yield Strength | ksi (MPa) | 35 (242) |
| Elongation | % in 2 in. | 30 |
| Typical Hardness Ann. | Rockwell HRB | 80 |
| Modulus of Elasticity | ksi (MPa) | 23 (159) |

Source: ASTM International F30-96 (2017)

AVERAGE LINEAR COEFFICIENT OF THERMAL EXPANSION $\mu\text{m}/\text{m}\cdot\text{°C}^*$

| Temperature Range °C | 46 Alloy UNS K94600 |
|----------------------|-----------------------|
| 30 to 300 | 7.5 |
| 30 to 350 | 7.1 to 7.8* |
| 30 to 400 | 7.5 |
| 30 to 500 | 8.2 to 8.9* |
| 30 to 600 | 9.8 |
| 30 to 700 | 10.7 |
| 30 to 800 | 11.6 |
| 30 to 900 | 12.5 |
| 30 to 1000 | 13.4 |

Source: ASTM F30-96 (2017), Table X1.1, 46 Alloy; *ASTM F30 (2017) Table 2

CHEMISTRY %

Nickel 46 nom., Manganese 0.80 max., Silicon 0.30 max., Carbon 0.05 max., Chromium 0.25 max., Phosphorus 0.025 max., Sulfur 0.025 max., Aluminum 0.10 max., Bal. Iron. Source: ASTM F30-96 (2017), Table 1, 46 Alloy

SPECIFICATIONS

ASTM F30 • AMS I-23011 CL 4 • MIL-I-23011 CL 4 • UNS K94600

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Special Purpose Alloys & Metals From Stock

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Special Purpose Alloys

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Controlled Expansion | Glass Sealing

Ed Fagan Inc. supplies the highest quality metals and alloys including materials from Carpenter Technology Corp.

Kovar® | ASTM F15 Alloy

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

Alloy 42/46/48/52

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

Free-Cut Invar "36"® Alloy

Forms: Round Bar, Wire

Invar "36"® Alloy

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

Super Invar 32-5®

Forms: Plate, Round Bar, Sheet

Refractory Metals and Alloys

Ed Fagan Inc. is your leading source for quality refractory metals and alloys. We stock Tungsten, Molybdenum and its alloys in various forms and sizes manufactured from Plansee Group.

Molybdenum

Forms: Plate, Precision Cut Wire, Round Bar, Sheet/Strip, Spooled Wire, Threaded Rod/Nuts

Molybdenum Lanthanum Oxide (ML)

Forms: Sheet – Stress Relieved, Recrystallized

Molybdenum TZM

Forms: Plate, Round Bar

Niobium

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

Rhenium

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

Tantalum

Forms: Round Bar, Sheet

Tungsten

Forms: Parts (To Specification), Plate, Precision Cut Wire, Round Bar, Sheet

Tungsten Alloy

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

Soft Magnetic Alloys | EMI Shielding & Laminations

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

EFI Alloy 50

Forms: Round Bar, Square Bar, Strip/Coil, Wire
Trade Names: Alloy 4750, High Permeability 49®, Magnifer® 50

EFI Alloy 79

Forms: Rectangular Bar, Round Bar, Sheet, Strip/Coil, Wire
Trade Names: Hipernom, HyMu80®, Magnifer® 7904, Molypermalloy, Permalloy 80®

Hiperco® 50, Hiperco® 50A, Hiperco® 50 HS

Forms: Plate, Round Bar, Strip/Coil

Carpenter VimVar Core Iron

Forms: Plate, Round Bar

Electrical & Electronic Nickels

Ed Fagan Inc. supplies select, commercially pure grades of Nickel in various forms and sizes.

Electronic Nickels

200/201/205/233/270

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

Alloys and Metals We Distribute

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

Ed Fagan Inc. Services

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

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.

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