



## ED FAGAN INC.

# Soft Magnetic Alloys

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### efi Alloy 79

**Description:** A soft magnetic alloy consisting of 80% Nickel, 5% Molybdenum, and balance Iron used where extremely high initial & maximum permeability and minimum hysteresis is needed.

**Applications:** Electro-magnetic shielding, specialty transformer laminations, toroidal tape wound cores, high quality motor laminations, stepping motors.

**AKA:** Magnifer 7904<sup>2</sup>, Carpenter HyMu 80<sup>1</sup>, Hipernom<sup>1</sup>, Moly-Permalloy, Permalloy 80

### efi Alloy 50

**Description:** A soft magnetic alloy, consisting of 49% Nickel, balance Iron used where high initial permeability, maximum permeability, and low core loss is needed.

**Applications:** Transformer cores, highly efficient motors, shielding, and specialized electronic devices, such as LF power transducers, chokes, relay parts, solenoids & oscillators.

**AKA:** Magnifer 50<sup>2</sup>, Carpenter High Permeability 49<sup>1</sup>, Alloy 47-50

### Hiperco 50<sup>1</sup>

**Description:** An alloy of 49% Cobalt, and 2% Vanadium. This alloy exhibits the highest magnetic saturation of any commercial alloy and excels in applications where this attribute is needed. This alloy has higher mechanical strength than other soft magnetic alloys.

**Applications:** Electrical generators, pole pieces for electromagnets, magnetic bearings, and high magnetic flux devices and instruments.

### Footnotes

1. Trademark Carpenter Technology Corp., Reading PA
2. Trademark ThyssenKrupp-VDM, Germany

### Radiometal 4550

**Description:** Radiometal 4550 is a Soft Magnetic Alloy consisting of 45% Nickel, balance iron alloy, and has excellent permeability with high saturation flux density.

**Applications:** Sensitive relays that need to respond to very weak currents. Radiometal 4550 is also widely used in transformers, chokes and special motors where the properties of silicon-iron do not provide the required magnetic performance.

### Vim Var Core Iron

**Description:** Carpenter VIM VAR Core Iron is a low carbon magnetic iron produced using vacuum induction melting plus vacuum arc re-melting practices. Other elements commonly found in low carbon irons are held as low as possible to ensure good DC magnetic properties. This double melting technique controls the distribution of nonmetallic inclusions to a minimum length and frequency so that thin wall sections will not contain leaks due to internal discontinuities.

**Applications:** Carpenter VIM VAR Core Iron is often used in the manufacture of soft magnetic components where vacuum integrity is needed such as in power tubes and microwave devices. In addition, relays, solenoids, and magnetic pole pieces for scientific instruments may be made utilizing the qualities of VIM VAR Core Iron.

**AKA:** Carpenter Consumet Core Iron<sup>1</sup>

**EFI also has a large inventory of Special Purpose Materials, Metals and Alloys for Refractory, Controlled Expansion and other Applications.**

For customers in North America, contact  
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## TYPICAL DC MAGNETIC PROPERTIES

	EFI Alloy 79	EFI Alloy 50	Hiperco 50	Vim Var Core Iron
Saturation Induction - Gauss	8,700	14,500	24,200	21,500
Maximum Permeability	230,000	100,000	10,000	10,000
Coercive Force - Oersteds	0.015	0.06	0.4	1
Coercive Force - A/m	1.19	4.77	31.83	79.58

## TYPICAL AC MAGNETIC PROPERTIES

	EFI Alloy 79	EFI Alloy 50	Hiperco 50	Vim Var Core Iron
Core Loss W/lb @400Hz & 20k G	N/A	N/A	34	N/A
B-40 Permeability @60 Hz	45,000	6,500	N/A	N/A

N/A = not a typical application value

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

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Physical Properties	UNIT	EFI Alloy 79	EFI Alloy 50	Hiperco 50	Vim Var Core Iron
Density	lb/cu in	0.316	0.295	0.293	0.284
Specific Gravity		8.74	8.18	8.12	7.86
Curie Temp	°F	860	840	1710	1400
	°C	460	450	932	760
Melting Point	°F	2650	2600	2600	-
	°C	1454	1427	1427	-
Electrical Resistivity	micro-ohm-cm	59	49	41	13
	ohm-cir mil/ft	349	290	240	78
Thermal Conductivity	W/cm °C	0.35	0.13	0.29	0.73
	BTU-in/sq. ft-hr-°F	240	90	200	508
Specific Heat	Cal/g-°C	-	0.12	-	0.11
	BTU/lbm-°F	-	0.12	-	0.11
Thermal Expansion	ppm/°F (75°F to 842°F)	7.5	5.0	5.6	8.2
	ppm/°C (25°C to 450°C)	13.6	9.0	10.2	14.7
Mechanical Properties					
Tensile Strength	ksi	98	75	118	50
	MPa	676	518	814	345
Yield Strength	ksi	38	23	63	27
	MPa	262	159	435	190
Elongation	% in 2 in.	40	40	9	45
Typical Hardness	Rockwell	HRB 85	HRB 80	HRC 20	HRB 60
Modulus of Elasticity	Mpsi	31.4	24	30	30
	kMPa	217	166	207	207
Chemistry					
maximum % unless noted	Iron	Bal	49	49 nom.	99.8 nom.
	Nominal Nickel	80	51	-	0.08
	Nominal Cobalt	-	-	49 nom.	-
	Molybdenum	5.0 nom.	-	-	-
	Carbon	0.03	0.02	0.01	0.02
	Manganese	0.95	0.5	-	0.12
	Silicon	0.42	0.35	0.05	0.12
	Vanadium	-	-	2 nom.	0.05
	Niobium	-	-	0.05	-
	Phosphorus	0.02	-	-	0.01
	Sulfur	0.008	-	-	0.01
Specifications					
	ASTM	A753	A753	A801	A848
	MIL	N-14411C	N-14411C	A47182	-
	AMS			A47182	-

For Radiometal 4550 physical, mechanical, and magnetic properties, see Radiometal 4550 data sheet.

## FORMS AVAILABLE

	EFI Alloy 79	EFI Alloy 50	Vim Var Core Iron	Hiperco 50	High Perm 49F	Radiometal 4550
Rod	3.556mm - 41.275mm	6.350mm - 101.60mm	12.70mm - 260.350mm	22.225mm - 44.450mm	-	12.70mm - 50.80mm
Sheet	0.254mm - 3.175mm AN	-	-	-	-	-
Strip/Coil	0.101mm - 0.635mm AN	0.050mm - 1.270mm AN	-	0.050mm - 1,270mm	-	0.381mm HR, IC
		0.177mm - 0.355mm RG	-			0.381mm HR, UC
Square Bar		26.162mm - 51.562mm	*	-	45.237mm - 61.976mm FM	-

If you do not see the metal/alloy in the form or size you require, please call us with your size, shape, form, and quantity requirements for a material price quote.

AN – Annealed, FM – Free Machined, IC – Inlac Coated, HR – Hard Rolled, UC – Uncoated. Strip/Coil can be slit to customer requirements down to 4mm widths.

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