

CarTech® HyMu "800" Alloy

Type Analysis

Single figures are nominal except where noted.

Carbon	0.01 %	Manganese	0.50 %
Silicon	0.15 %	Nickel	80.00 %
Molybdenum	5.00 %	Iron	Balance

General Information

Description

CarTech HyMu "800" alloy is a nickel-molybdenum-iron alloy capable of being heat treated to show very high initial permeabilities, maximum permeabilities and AC core losses at low magnetic flux densities.

This alloy is produced in strip form at thicknesses less than 0.008" (0.02 mm). Cut lengths, heat treated to magnetic property requirements ready for photoetching, can be supplied. Coiled strip, suitable for blanking or forming, can also be produced.

Applications

CarTech HyMu "800" has been used to produce toroids for core components.

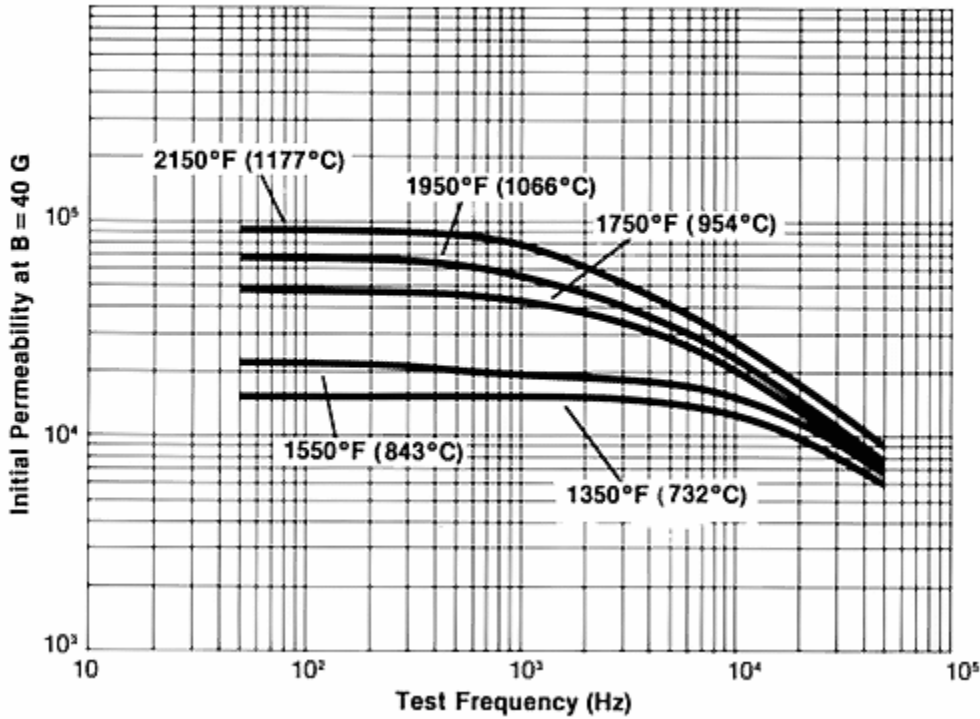
Properties

Physical Properties

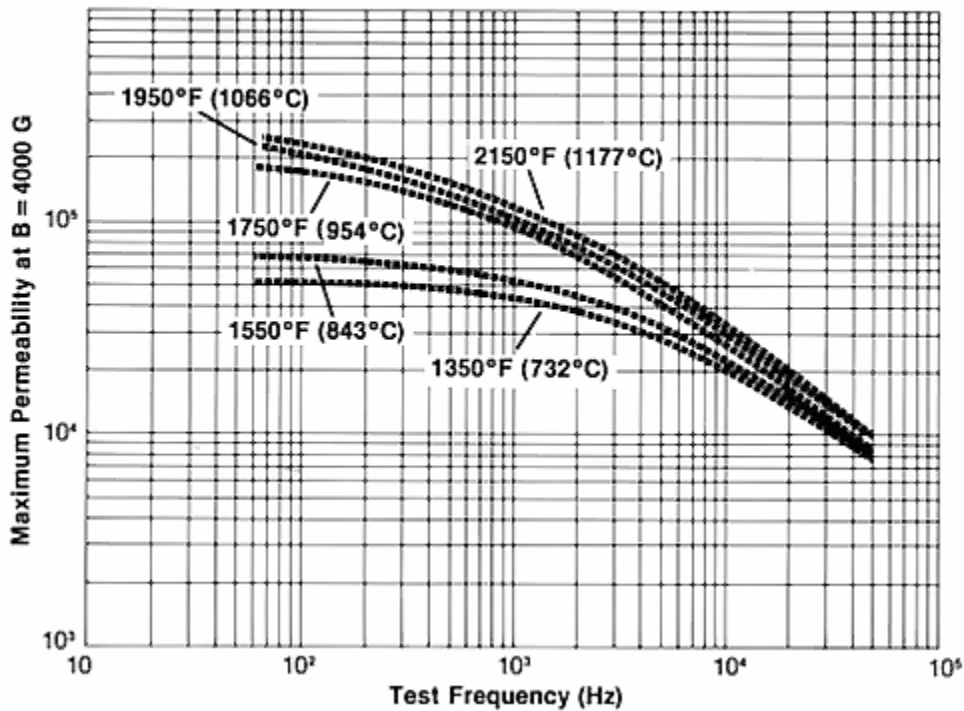
Specific Gravity	8.74
Density	0.3160 lb/in ³
Mean Specific Heat	0.1180 Btu/lb/°F
Mean CTE (-90 to 400°F)	7.20 x 10 ⁻⁶ in/in/°F
Thermal Conductivity	240.0 BTU-in/hr/ft ² /°F
Electrical Resistivity (70°F)	370.0 to 380.0 ohm-cir-mil/ft
Temperature Coeff of Electrical Resist (0 to 930°F)	6.00 x 10 ⁻⁴ Ohm/Ohm/°F
Curie Temperature	860 °F
Melting Range	2650 °F

Magnetic Properties

Effect of Annealing Treatment on Magnetic Permeability—Carpenter HyMu "800"
Initial permeability vs. test frequency for 0.002" (0.051 mm) strip.

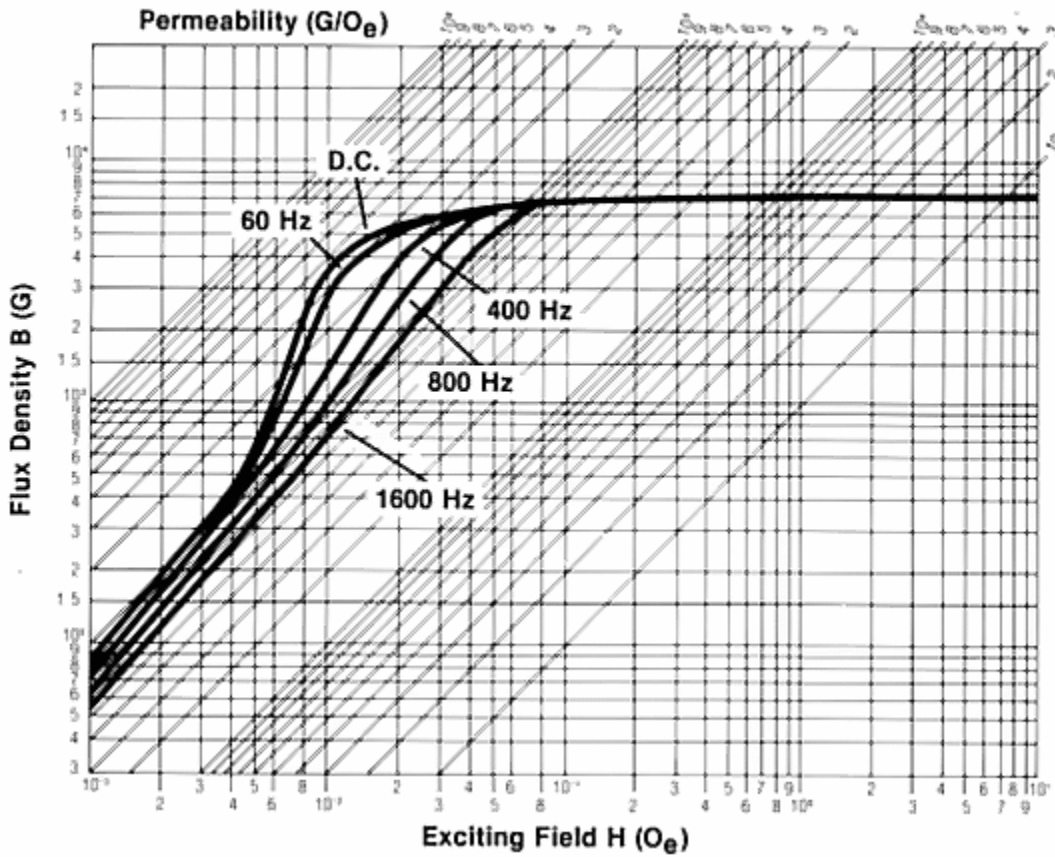


Effect of Annealing Temperature on Magnetic Permeability—Carpenter HyMu "800"
Permeability at high flux levels (B = 4000 G) vs. test frequency for 0.002" (0.051 mm) strip.

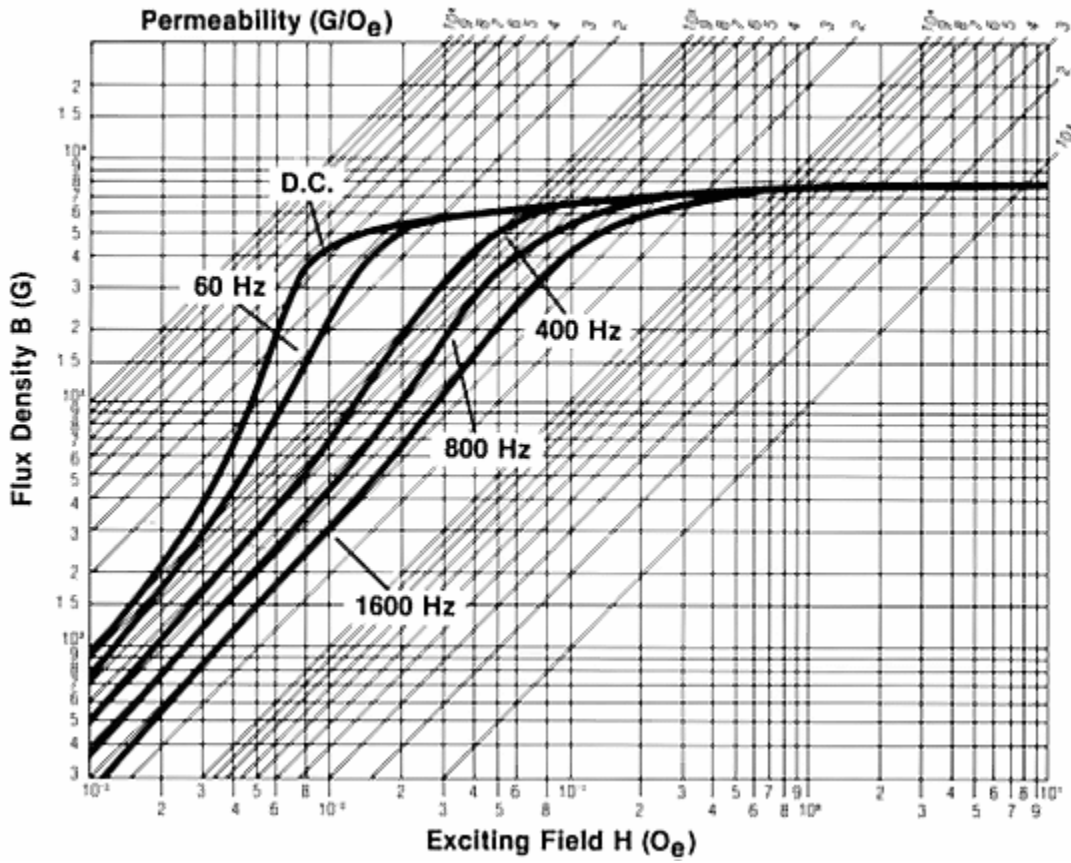


Typical Magnetization Curves—Carpenter HyMu "800"

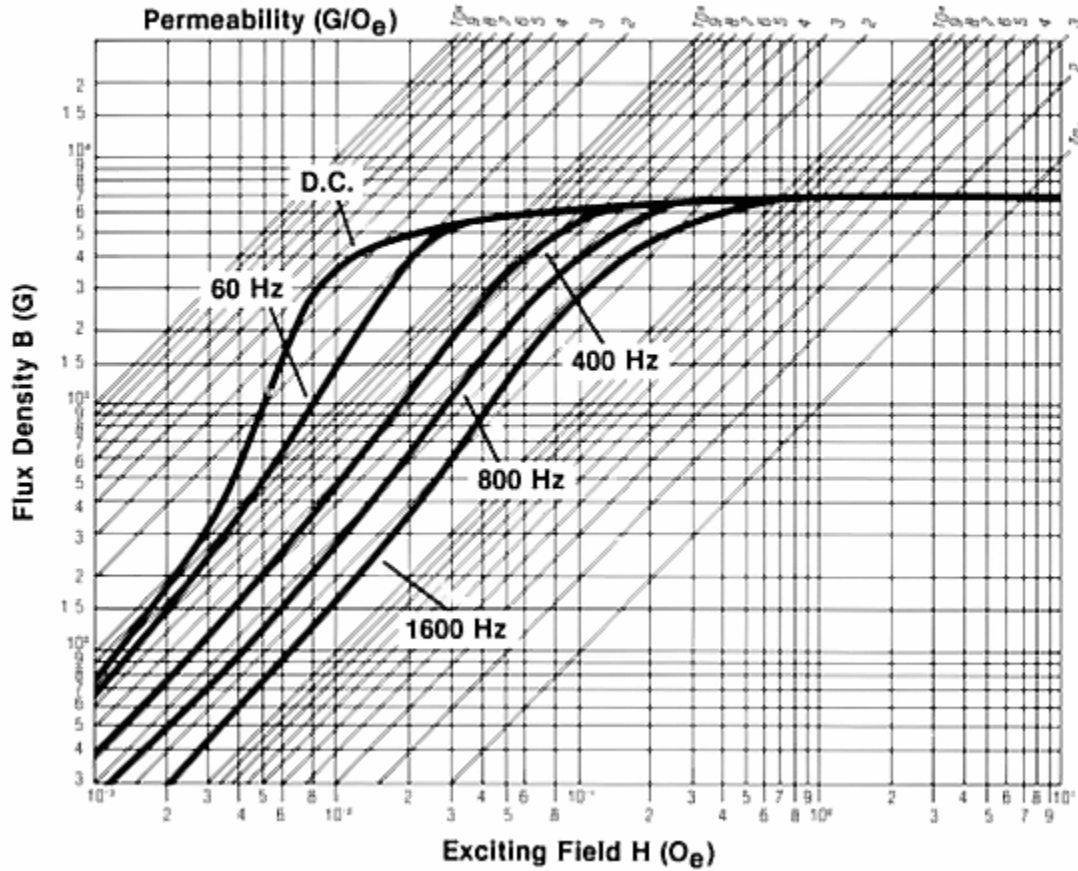
0.002" (0.051 mm) thick tape toroid, 1" (25.4 mm) ID x 1¼" (31.8 mm) OD.



Typical Magnetization Curves—Carpenter HyMu "800"
0.004" (0.10 mm) thick tape toroid, 1" (25.4 mm) ID x 1¼" (31.8 mm) OD.



Typical Magnetization Curves—Carpenter HyMu "800"
 0.006" (0.15 mm) thick tape toroid, 1" (25.4 mm) ID x 1¼" (31.8 mm) OD.



Heat Treatment

Annealing

In-Process Anneal:

In-process annealing for further cold rolling of strip products should consist of a strand annealing operation in a nonoxidizing, noncarburizing atmosphere (dry hydrogen or NH₃ preferred) at 1830/1920°F (1000/1050°C) that will produce a tensile strength of 100 ksi (690 MPa) maximum.

Thermal Treatment for Magnetic Properties:

Specific magnetic characteristics are obtainable through selection of the thermal treatment used; low temperatures 1350/1650 °F (732/843 °C) for very high frequency response, and high temperatures 2050/2150 °F (1120/1177 °C) for low frequency response.

HyMu "800" should be annealed in an oxygen-free, dry-hydrogen atmosphere with a dew point below -40 °F (-40 °C). For uniformity of properties, material should be held 2 to 4 hours at temperature and cooled at a rate of 300/600 °F (167/333 °C) per hour through the order-disorder range 1200/800 °F (649/427 °C).

Oil, grease, lacquer and all other contaminants must be removed before annealing. The individual parts should be separated by an inert insulating powder such as magnesium or aluminum oxide during hydrogen annealing.

Other Information

Applicable Specifications

- ASTM A753 Alloy 4

CarTech® HyMu "800" Alloy

Forms Manufactured

Strip in thicknesses less than 0.008" (0.02 mm).

Available from Carpenter Technology Corporation Special Products Division, El Cajon, California:

Panels - annealed to provide magnetic properties ready for photoetching, 8" wide x up to 0.0145" thick x up to 37" long.

Panels - cold rolled ready for heat treatment, 8" wide x up to 0.0145" thick x up to 37" long.

- Sheet
 - Strip
-

Technical Articles

- [A Simplified Method of Selecting Soft Magnetic Alloys](#)
 - [Soft Magnetic Alloys with Improved Corrosion Resistance](#)
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