P6

Type analysis

Single figures are nominal except where noted.

Cobalt	45.00 %	**Iron**	Balance	**Nickel**	6.00 %
Vanadium	4.80 %				

Forms manufactured

Bar-Rounds	**Strip**	**Wire**

Description

P6 is a ductile, cobalt base precipitation hardened alloy, similar to Vicalloy, which combines the advantages of high hysteresis loss and low magnetizing force into one material. It exhibits the highest efficiency (loss per unit magnetizing force) of any known material.

Carpenter Technology manufactures semi-hard and hard magnet alloys that are ductile and can be fabricated by bending, drawing, cold rolling, machining, and stamping. After fabrication, these alloys require a final heat treatment to achieve the desired magnetic characteristics. These alloys can provide versatile alternatives to higher coercivity materials which, although they provide the magnetic properties required for countless applications, are difficult to fabricate because of their brittleness. Also, some of the higher coercivity materials may exhibit poor corrosion resistance and less than desirable temperature stability.

Key Properties:

- Ductility
- Highest efficiency of any known material
- High hysteresis loss
- Low magnetizing force

Markets:

- Aerospace
- Consumer

Applications:

- Biasing magnets in meters and magnetic actuators
- Magnetic coded devices
- Field coils
- Hysteresis motor laminations

> P6

Physical properties

PROPERTY	At or From	English Units
SPECIFIC GRAVITY	—	8.16
DENSITY	—	0.2850 lb/in^3
MEAN COEFFICIENT OF THERMAL EXPANSION	—	7.22 x 10^{-6} in/in/°F
ELECTRICAL RESISTIVITY	70°F	198.6 ohm-cir-mil/ft
CURIE TEMPERATURE	—	1580°F

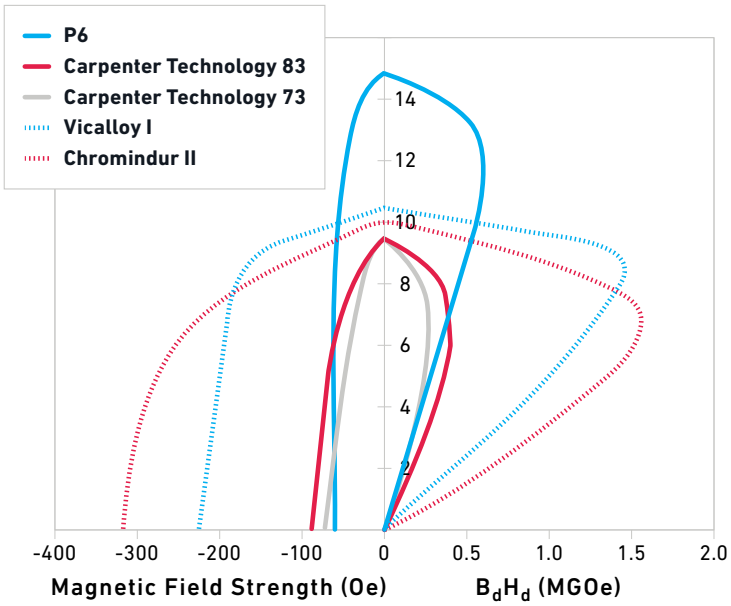
COMPARISON OF PHYSICAL PROPERTIES

ALLOY	SPECIFIC GRAVITY	DENSITY (lb/in³)	COEFFICIENT OF THERMAL EXPANSION (ppm/°C)	ELECTRICAL RESISTIVITY (μΩ-cm)	CURIE TEMPERATURE (°C)	HEAT TREATED HARDNESS (HRC)
P6	8.16	0.295	13.0	33	—	55
Carpenter Technology 83	7.75	0.280	11.2	27	—	60
Carpenter Technology 73	7.75	0.280	11.7	29	745	60
Vicalloy I	8.16	0.295	12.0	63	855	60
Chromindur II	7.90	0.285	—	75	640	30

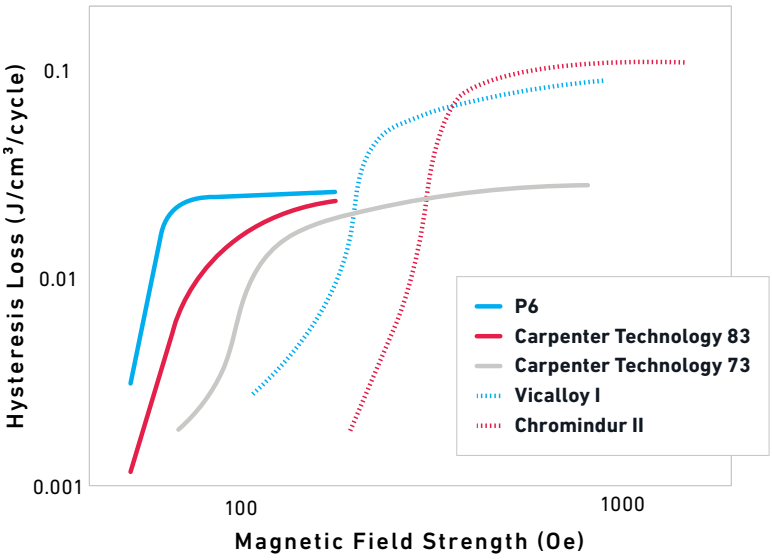
> P6

Magnetic properties

FLUX DENSITY (kG)



MAGNETIC FIELD STRENGTH VS. HYSTERESIS LOSS



> P6

COERCIVITY	63.0 Oe
MAXIMUM PERMEABILITY	180.000
RESIDUAL INDUCTION	14400 G
INDUCTION	17000 G
HYSTERESIS LOSS	0.0230 J/cm³/cycle

COMPARISON OF MAGNETIC PROPERTIES

ALLOY	PEAK MAGNETIC FIELD STRENGTH Oe (kA/m)	PEAK INDUCTION G (T)	COERCIVE FORCE Oe (kA/m)	RESIDUAL INDUCTION G (T)	MAXIMUM ENERGY PRODUCT MGOe (kJ/m³)
P6	250 (20)	17000 (1.7)	63 (5.0)	14400 (1.44)	0.60 (4.8)
Carpenter Technology 83	300 (24)	12500 (1.25)	80 (6.4)	9700 (0.97)	0.38 (3.0)
Carpenter Technology 73	300 (24)	13000 (1.3)	60 (4.8)	10300 (1.03)	0.30 (2.4)
Vicalloy I	750 (60)	12000 (1.2)	210 (17)	10700 (1.07)	1.4 (11)
Chromindur II	1500 (120)	15000 (1.5)	320 (26)	10100 (1.01)	1.6 (13)

Heat treatment

After fabricating to the desired form, the material should be degreased prior to final age hardening heat treatment. The material should then be placed into a furnace with a protective atmosphere and held at 550 to 600°C for two to five hours.

This final heat treatment is necessary to obtain the desired magnetic characteristics of the material. Adjustment of the magnetic properties is possible via control of the final heat treatment.

For additional information, please contact your nearest sales office:
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