INTRODUCTION

Micrometals 200C Series™ of magnetic alloy materials are specifically designed for severe environment applications where cores are exposed to or generate elevated temperatures. These cost-competitive core materials are not subject to thermal aging for operating temperatures up to +200 °C. Revision C of this catalog introduces 2 new materials to the 60 series of materials. The -63 Material offers excellent high frequency properties while the -66 Material offers core losses that are well suited from 100kHz to 500kHz.

FINISH

The toroidal cores are provided with a protective coating. The T16 and T20 sizes are coated with Parylene C. The larger cores are coated with a two color code finish that is UL approved for Flame Class UL94V-0 per file #E140098(S).

AVAILABILITY

Part numbers which appear in bold print are considered stock items and will be most available. Other items are available on a build-to-order basis.

SAMPLES & ENGINEERING KITS

Micrometals will gladly extend sample cores and design assistance to aid in your core selection. Contact the factory regarding available engineering kits.

WARRANTY

Parts are warranted to conform to the specifications in the latest issue of this catalog. Micrometals’ liability is limited to return of parts and repayment of price; or replacement of nonconforming parts. Notice of nonconformance must be made within 30 days after delivery. Before using these products, buyer agrees to determine suitability of the product for their intended use or application. Micrometals shall not be liable for any other loss or damage, including but not limited to incidental or consequential damages.
GENERAL MATERIAL PROPERTIES

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<thead>
<tr>
<th>Material Mix No.</th>
<th>Reference Permeability ($\mu_0$)</th>
<th>Material Density (g/cm$^3$)</th>
<th>Relative Cost</th>
<th>Color Code</th>
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CORE LOSS COMPARISON (mW/cm$^3$)

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<th>50kHz @225G</th>
<th>100kHz @140G</th>
<th>500kHz @50G</th>
<th>1MHz @40G</th>
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PERM. WITH DC BIAS

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<th>1MHz @40G</th>
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MAGNETIC TOLERANCE & DIMENSIONAL TOLERANCE (inches)

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<th>-M125 Material</th>
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TOROIDS*

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E-CORES

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MATERIAL DESCRIPTION

60 Series: The 60 series of materials are cost effective magnetic powder alloy materials available in a wide range of properties with permeabilities ranging from 35 to 66. The -63 Material has excellent high frequency properties and can be utilized past 10MHz. The -66 Material has the best performance in the 100kHz to 500kHz range.

70 Series: The 70 series is a magnetic powder alloy including nickel. The -70 Material has higher permeability then the 60 series with excellent losses up to 400kHz. The -70 Material is a relatively expensive material, most competitively priced in smaller sizes.

M Series: The M series is a moly-permalloy powder material and will have the highest permeability and lowest losses below 200kHz. Similar to the -70 Material in cost, the –M125 Material will be most competitively priced in physically small sizes.
### TOROIDAL CORES

**COLOR CODE**
- 60 Brown/Black
- 61 Brown/Gray
- 63 Brown/Beige
- 66 Brown/Brown
- 70 Beige/Black
- M125 Lt. Blue/Lt. Blue

**TYPICAL PART NO.**

OD in 100th inches
Micrometals Mix No.
Letter indicates Alternate Height
Code Area For Other Characteristics

Refer to page 1 for tolerances.

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<th>ℓ cm</th>
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COLOR CODE
-60  Brown/Black
-61  Brown/Gray
-63  Brown/Beige
-66  Brown/Brown
-70  Beige/Black
-M125 Lt. Blue/Lt. Blue

TYPICAL PART NO.

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Refer to page 1 for tolerances.
### TOROIDAL CORES

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- 60 Brown/Black
- 61 Brown/Gray
- 63 Brown/Beige
- 66 Brown/Brown
- 70 Beige/Black
- M125 Lt. Blue/Lt. Blue

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**COLOR CODE**
- 60  Brown/Black
- 61  Brown/Gray
- 63  Brown/Beige
- 66  Brown/Brown
- 70  Beige/Black
- M125 Lt. Blue/Lt. Blue

**TYPICAL PART NO.**

Refer to page 1 for tolerances.

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<tr>
<td>T650-63</td>
<td>200.0</td>
<td>6.500/165</td>
<td>3.500/88.9</td>
<td>2.000/50.8</td>
<td>39.9</td>
<td>18.4</td>
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<td>T650-66</td>
<td>380.0</td>
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</table>
## MICROMETALS

### COLOR CODE
- 60 Brown/Black
- 66 Brown/Brown
- 70 Beige/Black

![Diagram of a bobbin with dimensions labeled A, B, C, D, F, and G.]

**E49-E100 Not Color Coded**
Refer to page 1 for tolerances.

### TYPICAL PART NO.

<table>
<thead>
<tr>
<th>MICROMETALS</th>
<th>A, nH/N^2</th>
<th>Part No.</th>
<th>E</th>
<th>TYPICAL DIMENSIONS</th>
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<tbody>
<tr>
<td></td>
<td>(BOBBIN)</td>
<td>(REF. SIZE)</td>
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<tr>
<td>E49-70</td>
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<tr>
<td>E75-60</td>
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<td>.750/19.1</td>
<td>.635/16.1</td>
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<td>.750/19.1</td>
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<tr>
<td>E137-60</td>
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<td>1.145/29.1</td>
<td>.375/9.53</td>
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<td>E137-66</td>
<td>113.0</td>
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<tr>
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<td>E168-66A</td>
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<tr>
<td>E220-60</td>
<td>196.0</td>
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<td>2.180/55.4</td>
<td>.820/20.8</td>
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<tr>
<td>E305-60</td>
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<td>3.051/77.5</td>
<td>.933/23.7</td>
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<tr>
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<td>3.051/77.5</td>
<td>1.244/31.6</td>
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<tr>
<td>E305-60A</td>
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<tr>
<td>E450-60</td>
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<td>E450-66</td>
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<tr>
<td>E610-66</td>
<td>500.0</td>
<td>6.102/155</td>
<td>6.102/155</td>
<td>1.866/47.4</td>
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</tbody>
</table>
### Magnetic Characteristics

**Percent Permeability vs DC Magnetizing Force**

Formula: \[ \%\mu_0 = \left(\frac{a+cH+eH^2}{1+bH+dH^2}\right)^{1/2} \]

Where: \( \%\mu_0 \) = Percentage (i.e. 90% = 90)

\( H \) = DC Magnetizing Force (oersteds)

<table>
<thead>
<tr>
<th>Material</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
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<tr>
<td>-60</td>
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<td>6.06x10^{-1}</td>
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<td>10050</td>
<td>2.12x10^{-1}</td>
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<td>-6.28x10^{-5}</td>
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<td>-66</td>
<td>10000</td>
<td>8.67x10^{-3}</td>
<td>-5.72</td>
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<td>-70</td>
<td>10040</td>
<td>-4.41x10^{-3}</td>
<td>-83.5</td>
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<tr>
<td>-M125</td>
<td>9900</td>
<td>-1.60x10^{-2}</td>
<td>-88.6</td>
<td>1.11x10^{-3}</td>
<td>0.2260</td>
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</tbody>
</table>

**Percent Permeability vs Peak AC Flux Density**

Formula: \[ \%\mu_0 = \left(\frac{a+cB+eB^2}{1+bB+dB^2}\right)^{1/2} \]

Where: \( \%\mu_0 \) = Percentage (i.e. 90% = 90)

\( B \) = Peak AC Flux Density (gauss)

<table>
<thead>
<tr>
<th>Material</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
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<tbody>
<tr>
<td>-60</td>
<td>9800</td>
<td>1.66x10^{-3}</td>
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<td>6.54x10^{-10}</td>
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<td>-3.41x10^{-5}</td>
<td>3.08</td>
<td>4.63x10^{-8}</td>
<td>-7.36x10^{-5}</td>
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<tr>
<td>-66</td>
<td>10000</td>
<td>4.64x10^{-5}</td>
<td>12.1</td>
<td>3.27x10^{-6}</td>
<td>-1.01x10^{-3}</td>
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<td>-70</td>
<td>10120</td>
<td>8.81x10^{-4}</td>
<td>11.4</td>
<td>8.82x10^{-9}</td>
<td>-8.29x10^{-4}</td>
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<tr>
<td>-M125</td>
<td>10120</td>
<td>8.81x10^{-4}</td>
<td>11.4</td>
<td>8.82x10^{-9}</td>
<td>-8.29x10^{-4}</td>
</tr>
</tbody>
</table>

**Core Loss vs Peak AC Flux Density**

Formula: \[ CL(mW/cm^3) = \frac{a}{B^3} + \frac{b}{B^{2.3}} + \frac{c}{B^{1.65}} + (df^2B^2) \]

Where: \( CL \) = Core Loss (mW/cm³)

\( B \) = Peak AC Flux Density (gauss)

\( f \) = Frequency (hertz)

<table>
<thead>
<tr>
<th>Material</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>-60</td>
<td>5.3x10^{8}</td>
<td>1.4x10^{8}</td>
<td>1.2x10^{6}</td>
<td>2.7x10^{-14}</td>
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<tr>
<td>-61</td>
<td>4.0x10^{8}</td>
<td>1.1x10^{8}</td>
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<td>2.4x10^{-14}</td>
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<tr>
<td>-63</td>
<td>9.9x10^{8}</td>
<td>2.6x10^{8}</td>
<td>1.0x10^{4}</td>
<td>3.3x10^{-15}</td>
</tr>
<tr>
<td>-66</td>
<td>1.7x10^{10}</td>
<td>5.0x10^{7}</td>
<td>1.2x10^{6}</td>
<td>1.7x10^{-14}</td>
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<tr>
<td>-70</td>
<td>1.0x10^{10}</td>
<td>1.3x10^{9}</td>
<td>7.9x10^{6}</td>
<td>4.2x10^{-14}</td>
</tr>
<tr>
<td>-M125</td>
<td>3.1x10^{10}</td>
<td>2.7x10^{9}</td>
<td>3.3x10^{6}</td>
<td>5.3x10^{-14}</td>
</tr>
</tbody>
</table>

*Curve fit formula valid only for ranges shown on graph

The magnetic characteristic curves shown on pages 8 and 9 have a typical tolerance of +20%, -10%.

The core loss curves on pages 10 to 12 have a typical tolerance of ±15%.
MAGNETIC CHARACTERISTICS

Percent Initial Permeability (%μ₀)
vs
Peak AC Flux Density

\[ B_{pk} = \frac{E_{rms}}{4.44 ANf} \]

\[ E_{rms} = RMS \text{ Sinewave Voltage (volts)} \]
\[ A = \text{Cross Section Area (cm}^2) \]
\[ N = \text{Number of Turns} \]
\[ f = \text{Frequency (hertz)} \]

Effective Permeability
vs
Frequency

\[ μ_e = \frac{\mu_{0}}{1 + \\frac{2f}{f_c}} \]

\[ f_c = \frac{1}{2\pi\sqrt{L/C}} \]

\[ L = \text{Inductance} \]
\[ C = \text{Capacitance} \]
CORE LOSS

-60 Material μ=55
Core Loss
vs
Peak AC Flux Density

-61 Material μ=35
Core Loss
vs
Peak AC Flux Density

NOTE: 1 tesla = 10,000 gauss
CORE LOSS

-63 Material $\mu_0 = 35$
Core Loss vs Peak AC Flux Density

-66 Material $\mu_0 = 66$
Core Loss vs Peak AC Flux Density

Bpk - Peak AC Flux Density (gauss) NOTE: 1 tesla = 10,000 gauss
-70 Material μ=100
Core Loss vs Peak AC Flux Density

NOTE: 1 tesla = 10,000 gauss

- M125 Material μ=125
Core Loss vs Peak AC Flux Density

NOTE: 1 tesla = 10,000 gauss
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