200C SERIES™

High Temperature Powder Cores For Power Applications

MICROMETALS
IRON POWDER CORES

Issue B
March 2005

MICROMETALS
IRON POWDER CORES

CONTENTS

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 of up to +200°C. Revision B of this catalog is a continuation of the dynamic evolution of 200C Series™. This update introduces a new material into the 60 family of materials (-61 Material.), updates the -70 Material core losses and officially launches the M Series of molypermalloy powder (MPP) core materials.

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.

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GENERAL MATERIAL PROPERTIES

Material Mix No.	Reference Permeability (μ_0)	Material Density (g/cm^3)	Relative Cost	Color Code
-60	55	6.1	2.7	Brown/Black
-61	35	6.1	2.4	Brown/Gray
-70	100	7.4	8.5	Beige/Black
-M125	125	7.7	10	Lt. Blue/Lt. Blue

CORE LOSS COMPARISON (mW/cm^3) — PERM. WITH DC BIAS

Material Mix No.	60Hz @5000G	1kHz @1500G	10kHz @500G	50kHz @225G	100kHz @140G	500kHz @50G	1MHz @40G	DC = 50 Oersteds $\%\mu_0$	DC = 50 Oersteds $\mu_{effective}$
-60	40.3	71.5	75.7	70.2	51.6	38.2	68.2	74	40.6
-61	80.3	117.7	112.5	97.4	68.5	43.4	71.6	87	30.5
-70*	5.8	9.0	9.6	12.5	13.0	28.2	69.5	50	49.5
-M125	5.3	6.3	6.2	10.4	12.7	34.0	85.8	46	57.5

*Revised since last catalog issue

MAGNETIC TOLERANCE & DIMENSIONAL TOLERANCE (inches)

MATERIAL MIX NO.	-60 Material	-61 Material	-70 Material	-M125 Material
A_L Tolerance	±10%	±10%	±10%	±10%

TOROIDS*	OD	ID	Ht	TOROIDS*	OD	ID	Ht
T14 - T20	±.010	±.010	±.010	**T80 - T141**	±.020	±.020	±.025
T22 - T39	±.015	±.015	±.020	**T150 - T225**	±.025	±.025	±.030
T40 - T72	±.020	±.020	±.020	**T249 - T400**	±.030	±.030	±.030

E-CORES	A	B	C	D	F	G	Max. Gap**
E49 - E118	±.010	±.010	±.005	±.007	±.005	±.007	.0015
E125 - E162	±.015	±.015	±.007	±.010	±.007	±.010	.0015
E168 - E225	±.015	±.015	±.010	±.010	±.007	±.010	.0020
E305 - E450	±.030	±.030	±.015	±.020	±.015	±.020	.0030

*Tolerance includes coating **Gap per piece.

MATERIAL DESCRIPTION

-60 Material: This 55 permeability material is less expensive than the –70 Material, has moderate core losses, and is the material to use for high power applications. It has good linearity with DC bias and is a good choice for automotive requirements

-61 Material: This material is a lower permeability version of the -60 Material with slightly higher core losses and a lower price. The benefits of the -61 Material will be most pronounced in physically large sizes especially under high biased conditions.

-70 Material: This material has a higher permeability than the -60 Material. It has excellent core losses up to 400 kHz with similar losses beyond. While it is more expensive, it will still be price competitive in the smaller sizes.

-M125 Material: This 125 permeability moly-permalloy powder material will have the lowest core losses for frequencies of 200 kHz or less. Similar to the -70 Material, physically small sizes will be most competitively priced.

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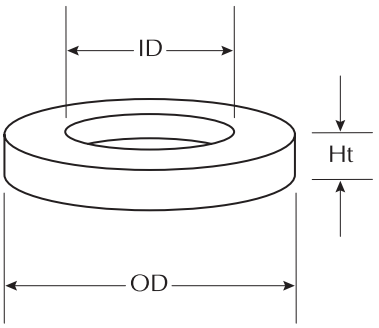
TOROIDAL CORES

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



TYPICAL PART NO.

T 80 - 60 B / ☐

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

Refer to page 1 for tolerances.

MICROMETALS Part No.	A_L nH/N^2	OD in/mm	ID in/mm	Ht in/mm	ℓ cm	A cm^2	V cm^3
T16-60	9.5	.160/4.06	.078/1.98	.060/1.52	.930	.015	.014
T16-70	17.0						
T20-60	13.0	.200/5.08	.088/2.24	.070/1.78	1.15	.023	.026
T20-70	22.5						
T25-60	17.0	.255/6.48	.120/3.05	.096/2.44	1.50	.037	.055
T25-70	31.0						
T26-60	41.5	.265/6.73	.105/2.67	.190/4.83	1.47	.090	.133
T26-70	77.0						
T30-60	22.0	.307/7.80	.151/3.84	.128/3.25	1.84	.060	.110
T30-70	40.5						
T30-M125	52.0						
T30-M125E	64.0	.310/7.87	.156/3.96	.156/3.96	1.84	.073	.134
T37-60	19.0	.375/9.53	.205/5.21	.128/3.25	2.31	.064	.147
T37-70	34.0						
T38-60	36.0	.375/9.53	.175/4.45	.190/4.83	2.18	.114	.248
T38-70	65.0						
T39-M125	53.3	.380/9.65	.188/4.78	.125/3.18	2.27	.072	.164
T40-M125	66.0	.400/10.2	.200/5.08	.156/3.96	2.39	.096	.229
T44-60	25.5	.440/11.2	.229/5.82	.159/4.04	2.68	.099	.266
T44-70	46.5						
T45-M125C	53.0	.440/11.2	.250/6.35	.156/3.96	2.75	.091	.250
T50-60	24.0	.500/12.7	.303/7.70	.190/4.83	3.19	.112	.358
T50-61	15.5						
T50-70	44.0						
T50-M125	56.0						
T50-60B	32.0	.500/12.7	.303/7.70	.250/6.35	3.19	.148	.471
T50-70B	58.0						

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COLOR CODE
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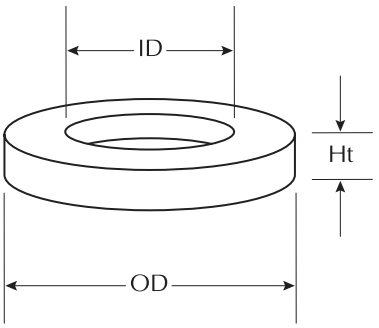
-70 Beige/Black
-M125 Lt. Blue/Lt. Blue



TYPICAL PART NO.

T 80 - 60 B /

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

Refer to page 1 for tolerances.

MICROMETALS Part No.	A_L nH/N^2	OD in/mm	ID in/mm	Ht in/mm	ℓ cm	A cm^2	V cm^3
T60-60	34.5	.600/15.2	.336/8.53	.234/5.94	3.74	.187	.699
T60-70	62.0						
T66-M125	72.0	.650/16.5	.400/10.2	.250/6.35	4.19	.192	.803
T68-60	29.0	.690/17.5	.370/9.40	.190/4.83	4.23	.179	.759
T68-61	18.5						
T68-70	53.0						
T68-60A	39.5	.690/17.5	.370/9.40	.250/6.35	4.23	.242	1.03
T68-70A	71.0						
T80-60	31.0	.795/20.2	.495/12.6	.250/6.35	5.14	.231	1.19
T80-61	19.5						
T80-70	56.0						
T80-M125	68.0						
T80-60B	46.5	.795/20.2	.495/12.6	.375/9.53	5.14	.347	1.78
T80-70B	84.0						
T90-60	47.0	.900/22.9	.550/14.0	.375/9.53	5.78	.395	2.28
T90-70	85.0						
T90-M125	90.0						
T93-M125	105.0	.928/23.6	.567/14.4	.350/8.89	5.96	.389	2.32
T94-60	42.0	.942/23.9	.560/14.2	.312/7.92	5.97	.362	2.16
T94-70	76.0						
T106-60	70.0	1.060/26.9	.570/14.5	.437/11.1	6.49	.659	4.28
T106-61	44.5						
T106-70	125.0						
T106-M125	157.0						
T106-60B	91.0	1.060/26.9	.570/14.5	.575/14.6	6.49	.858	5.57
T106-70B	163.0						
T130-60	58.0	1.300/33.0	.780/19.8	.437/11.1	8.28	.698	5.78
T130-61	37.0						
T130-70	105.0						

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TOROIDAL CORES

COLOR CODE
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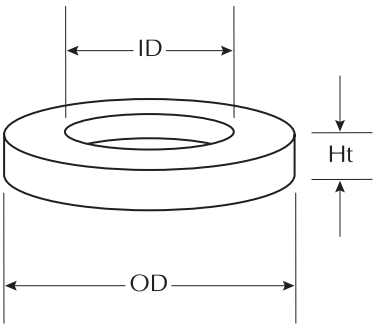
-70 Beige/Black
-M125 Lt. Blue/Lt. Blue



TYPICAL PART NO.

T 80 - 60 B /

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

Refer to page 1 for tolerances.

MICROMETALS Part No.	A_L nH/N^2	OD in/mm	ID in/mm	Ht in/mm	ℓ cm	A cm^2	V cm^3
T130-M125E	127.0	1.300/33.0	.780/19.8	.420/10.7	8.32	.666	5.54
T150-60	65.0	1.510/38.4	.845/21.5	.437/11.1	9.38	.887	8.31
T150-70	118.0						
T157-60	73.0	1.570/39.9	.950/24.1	.570/14.5	10.1	1.06	10.7
T157-61	46.5						
T157-70	130.0						
T175-60	82.0	1.750/44.5	1.070/27.2	.650/16.5	11.2	1.34	15.0
T184-60	116.0	1.840/46.7	.950/24.1	.710/18.0	11.2	1.88	21.0
T184-61	74.0						
T200-60	67.0	2.000/50.8	1.250/31.8	.550/14.0	13.0	1.27	16.4
T200-60B	120.0	2.000/50.8	1.250/31.8	1.000/25.4	13.0	2.32	30.0
T225-60	67.0	2.250/57.2	1.405/35.7	.550/14.0	14.6	1.42	20.7
T225-61	42.5						
T225-60B	120.0	2.250/57.2	1.405/35.7	1.000/25.4	14.6	2.59	37.8
T249-60	149.0	2.500/63.5	1.405/35.7	1.000/25.4	15.6	3.36	52.3
T250-60	177.0	2.500/63.5	1.250/31.8	1.000/25.4	15.0	3.84	57.4
T250-61	113.0						
T250-61A	56.0	2.500/63.5	1.250/31.8	.500/12.7	15.0	1.92	28.7
T300-60	58.0	3.040/77.2	1.930/49.0	.500/12.7	19.8	1.68	33.4
T300-61	37.0						
T300-60D	116.0	3.040/77.2	1.930/49.0	1.000/25.4	19.8	3.38	67.0
T400-60	96.0	4.000/102	2.250/57.2	.650/16.5	25.0	3.46	86.4
T400-60D	192.0	4.000/102	2.250/57.2	1.300/33.0	25.0	6.85	171
T400-61D	120.0						

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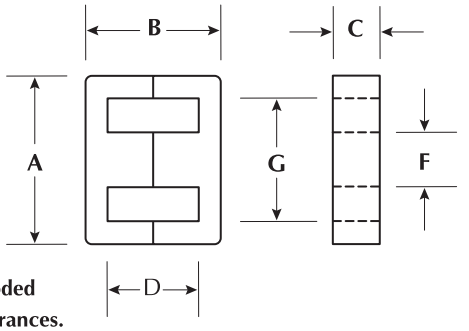
COLOR CODE
- 60 Brown/Black
- 70 Beige/Black



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

TYPICAL PART NO.

E 168 - 60 A / [ ]

"A" dimension in 100th inches
Micrometals Mix No.
Letter Indicates Alternate "C" dimension
Indicates Center-leg gap per half in .001 inches

E CORES ORDERED PER HALF

MICROMETALS Part No. (BOBBIN)	A_L nH/N^2 (REF. SIZE)	A in/mm	B in/mm	C in/mm	D in/mm	F in/mm	G in/mm	MAGNETIC DIMENSIONS ℓ cm	A cm^2	V cm^3	W cm^2
E49-60	29.0	.500/12.7	.437/11.1	.125/3.18	.312/7.93	.125/3.18	.375/9.53	2.86	.101	.288	.252
E49-70	45.0										
(PB49)	(US LAM: EE-28-29)										
E75-60	44.0	.750/19.1	.635/16.1	.187/4.75	.455/11.6	.187/4.75	.562/14.3	4.20	.226	.936	.551
E75-70	72.0										
(PB75)	(US LAM: EI-187)										
E100-60	65.0	1.000/25.4	.750/19.1	.250/6.35	.500/12.7	.250/6.35	.750/19.1	5.08	.403	2.05	.806
E100-70	110.0										
(PB100E)	(US LAM: EE-24-25)										
E137-60	100.0	1.375/34.9	1.145/29.1	.375/9.53	.770/19.6	.375/9.53	1.000/25.4	7.40	.907	6.72	1.55
E137-70	165.0										
(PB137)	(US LAM: EI-375)										
E162-60	149.0	1.625/41.3	1.342/34.1	.500/12.7	.842/21.4	.500/12.7	1.125/28.6	8.41	1.61	13.6	1.70
E162-70	250.0										
(PB162)	(US LAM: EI-21)										
E168-60	135.0	1.685/42.8	1.660/42.2	.590/15.0	1.210/30.7	.475/12.0	1.210/30.7	10.4	1.81	18.5	2.87
E168-70	225.0										
(PB168)	(DIN: 42/15)										
E168-60A	170.0	1.685/42.8	1.660/42.2	.787/20.0	1.210/30.7	.475/12.0	1.210/30.7	10.4	2.41	24.6	2.87
E168-70A	285.0										
(PB168A)	(DIN: 42/20)										
E220-60	196.0	2.210/56.1	2.180/55.4	.820/20.8	1.510/38.3	.680/17.3	1.520/38.6	13.2	3.60	47.7	4.09
(PB220)	(DIN: 55/21)										
E305-60	222.0	3.051/77.5	3.051/77.5	.933/23.7	2.118/53.8	.933/23.7	2.118/53.8	18.5	5.62	104	8.10
(PB305 or PB305/V0)											
E305-60A	280.0	3.051/77.5	3.051/77.5	1.244/31.6	2.118/53.8	.933/23.7	2.118/53.8	18.5	7.49	139	8.10
(PB305A or PB305A/V0)											
E450-60	400.0	4.500/114	3.636/92.4	1.375/34.9	2.250/57.2	1.375/34.9	3.120/79.3	22.9	12.2	280	12.7
(PB450/V0)	(US LAM: EI-30)										

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MAGNETIC CHARACTERISTICS

PERCENT PERMEABILITY vs DC MAGNETIZING FORCE

Formula: $\%\mu_0 = ((a+cH+eH^2)/(1+bH+dH^2))^{1/2}$ **Where:** $\%\mu_0$ = Percentage (i.e. 90% = 90)
H = DC Magnetizing Force (oersteds)

Material	a	b	c	d	e
-60	10140	6.06×10^{-3}	-0.570	2.24×10^{-4}	0.0304
-61	10050	2.12×10^{-3}	-0.362	8.82×10^{-5}	0.0137
-70	10040	-4.41×10^{-3}	-83.5	7.40×10^{-4}	0.2220
-M125	9900	-1.60×10^{-2}	-88.6	1.11×10^{-3}	0.226

PERCENT PERMEABILITY vs PEAK AC FLUX DENSITY*

Formula: $\%\mu_0 = ((a+cB+eB^2)/(1+bB+dB^2))^{1/2}$ **Where:** $\%\mu_0$ = Percentage (i.e. 90% = 90)
B = Peak AC Flux Density (gauss)

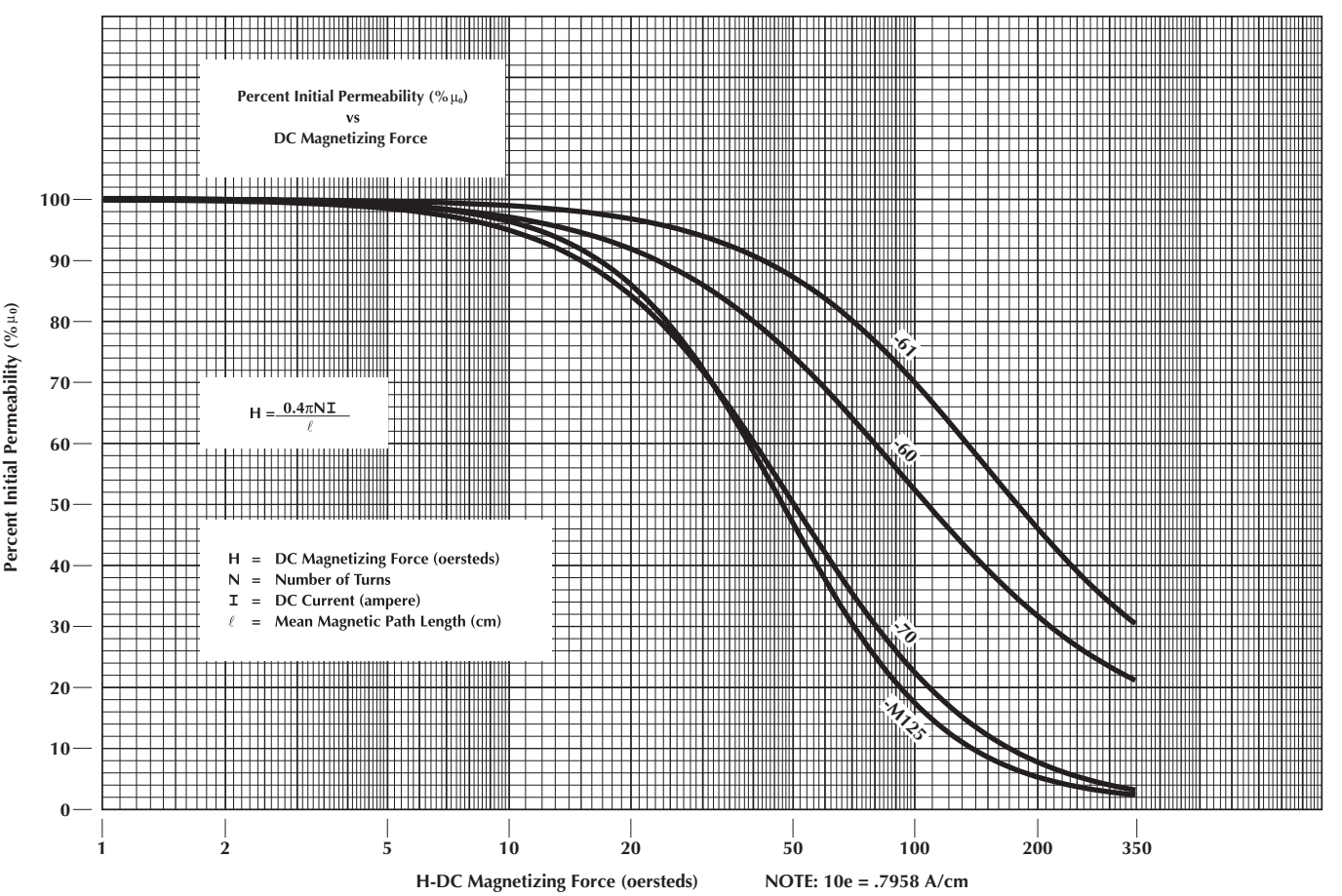
Material	a	b	c	d	e
-60	9800	1.66×10^{-3}	27.7	1.04×10^{-8}	-1.33×10^{-3}
-61	9970	4.95×10^{-4}	11.5	6.54×10^{-10}	-8.78×10^{-4}
-70	10120	8.81×10^{-4}	11.4	8.82×10^{-9}	-8.29×10^{-4}
-M125	10120	8.81×10^{-4}	11.4	8.82×10^{-9}	-8.29×10^{-4}

CORE LOSS vs PEAK AC FLUX DENSITY - See page 8

Formula: $CL(mW/cm^3) = \dfrac{f}{\frac{a}{B^3}+\frac{b}{B^{2.3}}+\frac{c}{B^{1.65}}} + (df^2B^2)$ **Where:** CL = Core Loss (mW/cm^3)
B = Peak AC Flux Density (gauss)
f = Frequency (hertz)

Material	a	b	c	d
-60	5.3×10^{8}	1.4×10^{8}	1.2×10^{6}	2.7×10^{-14}
-61	4.0×10^{8}	1.1×10^{8}	5.1×10^{5}	2.4×10^{-14}
-70	1.0×10^{10}	1.3×10^{9}	7.9×10^{6}	4.2×10^{-14}
-M125	3.1×10^{10}	2.7×10^{9}	3.3×10^{6}	5.3×10^{-14}

* Curve fit formula valid only for ranges shown on graph



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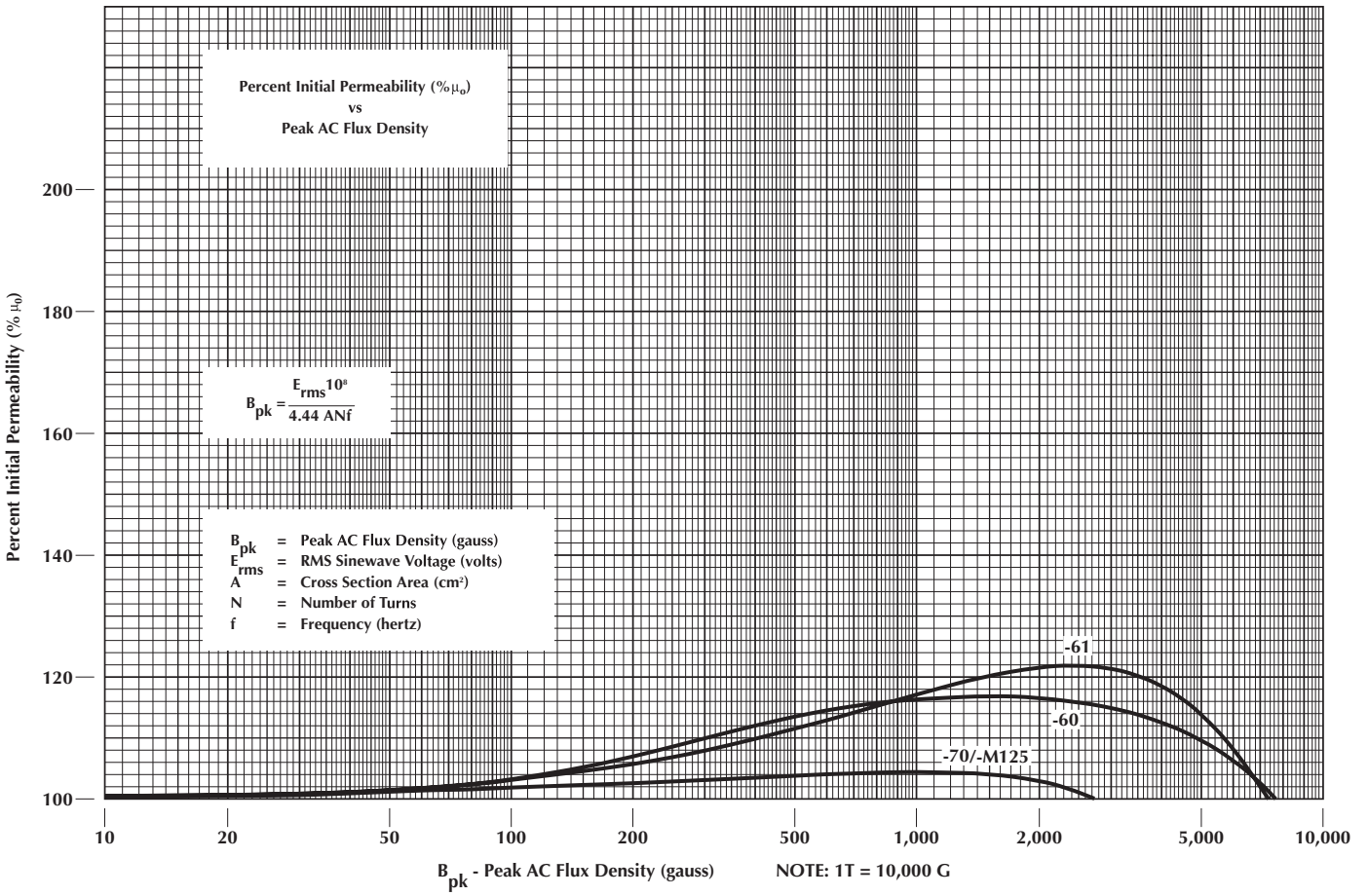

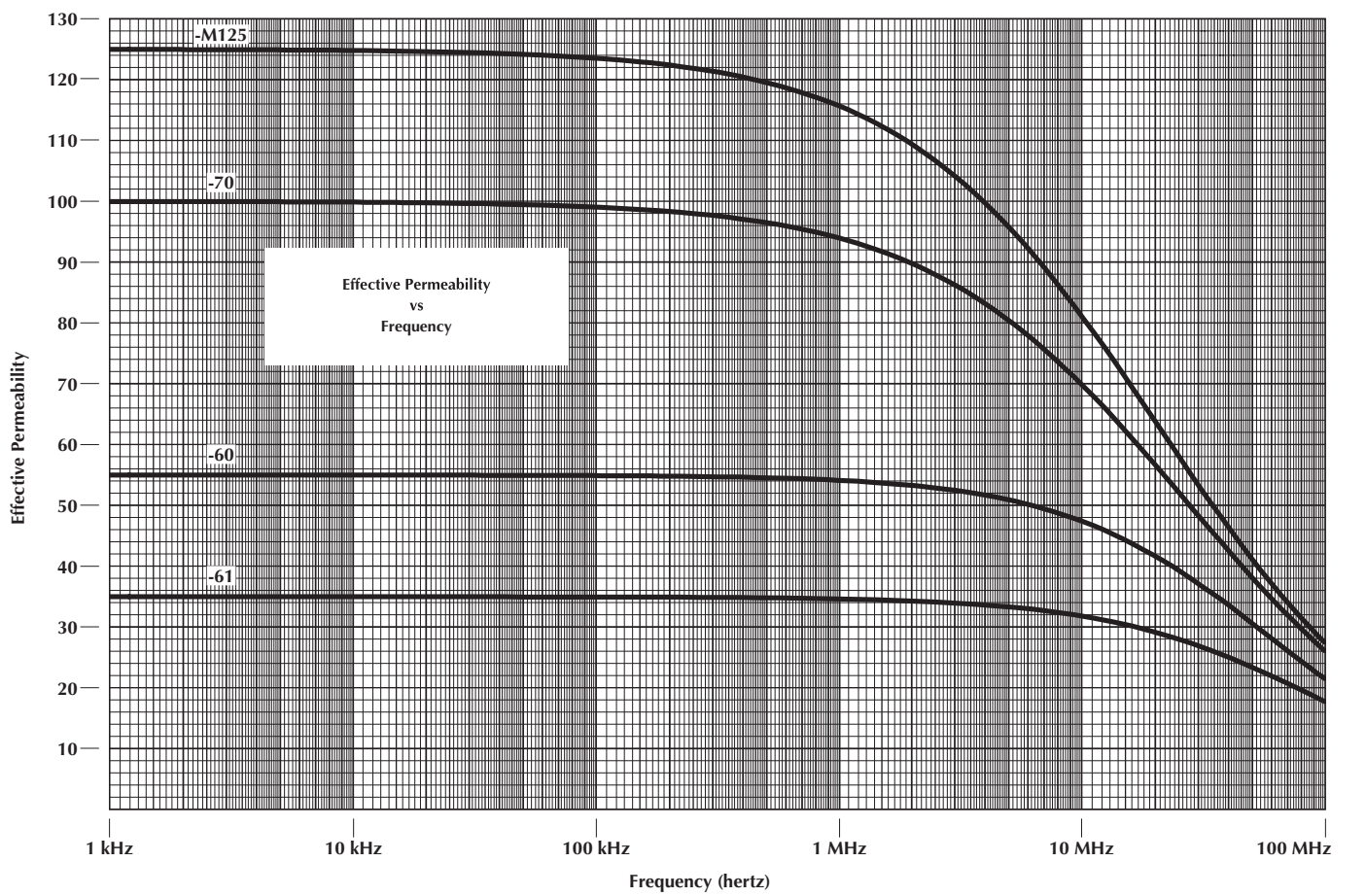

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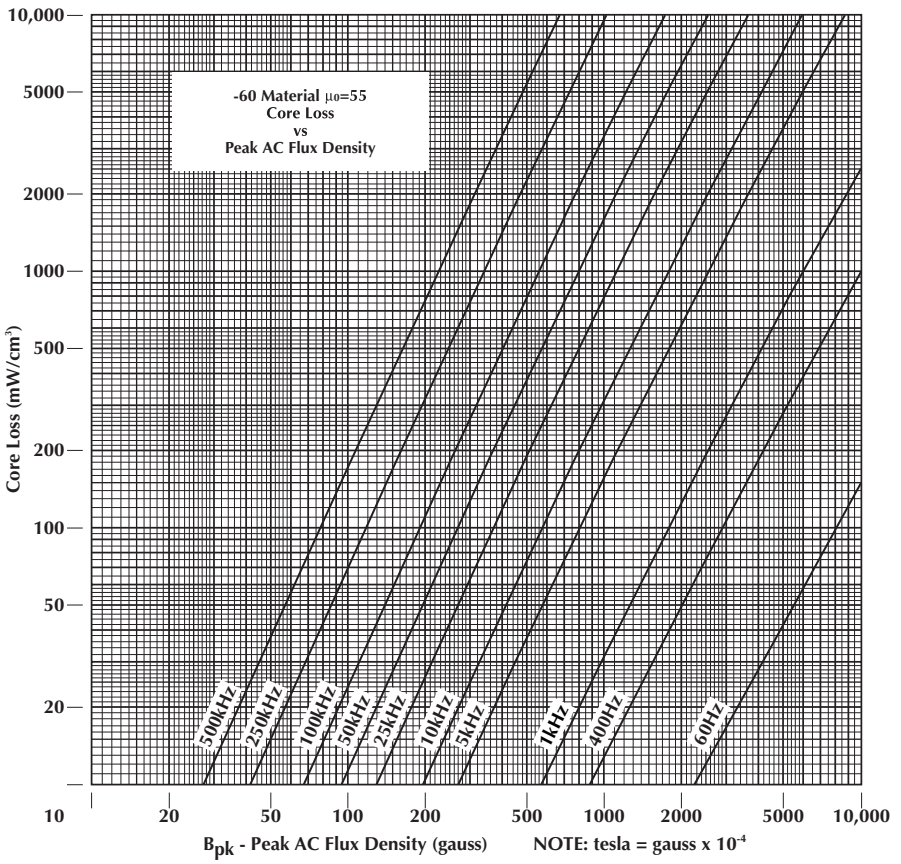
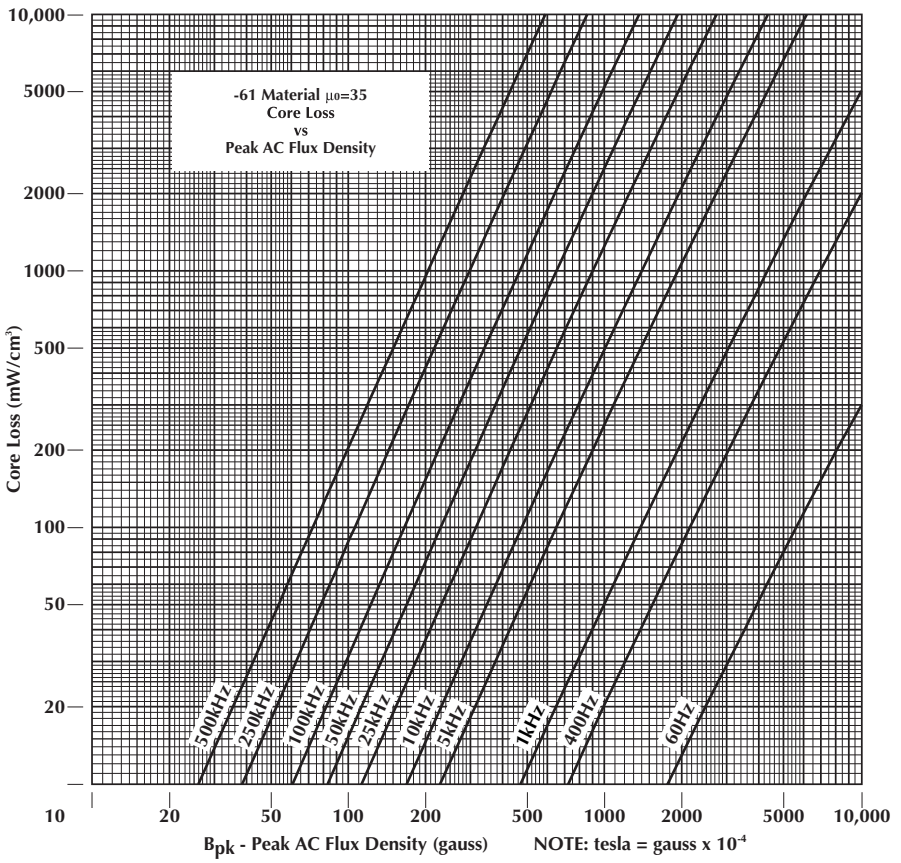
CORE LOSS





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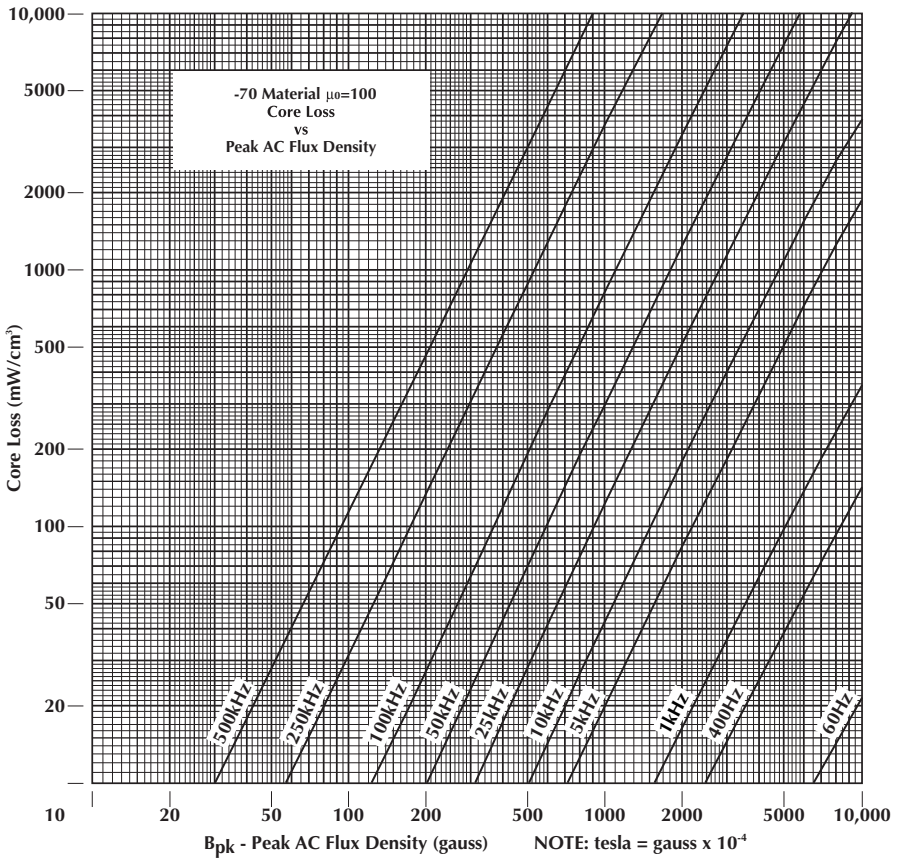

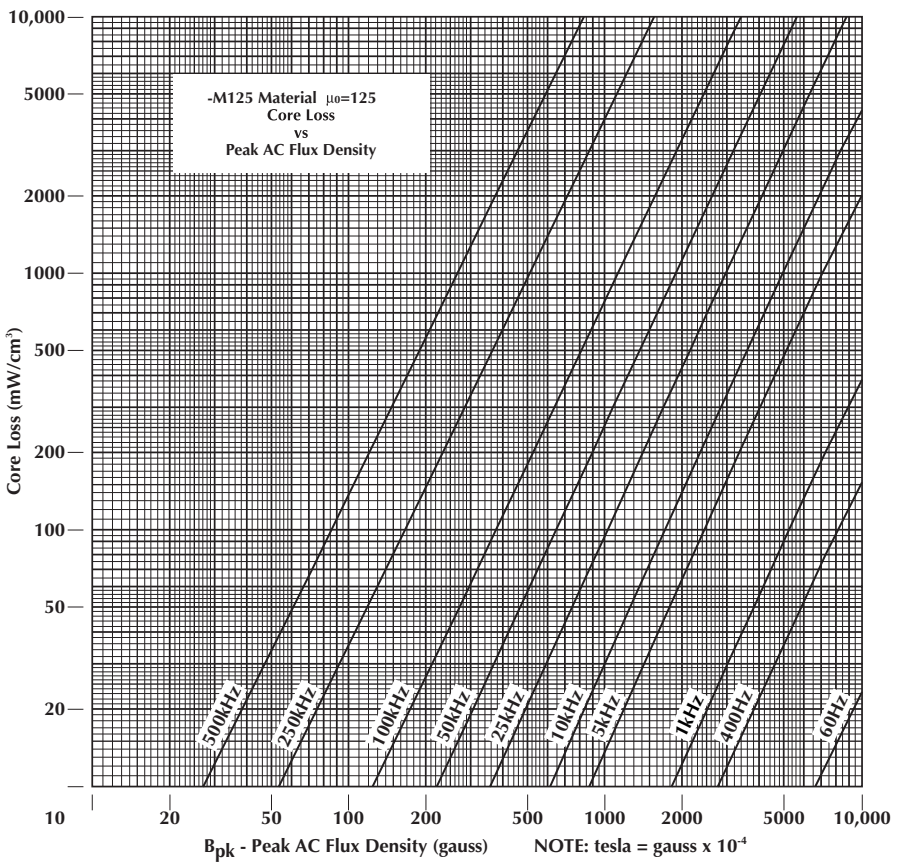

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MICROMETALS
IRON POWDER CORES

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