

Section 2. Materials

Material Characteristics (1)

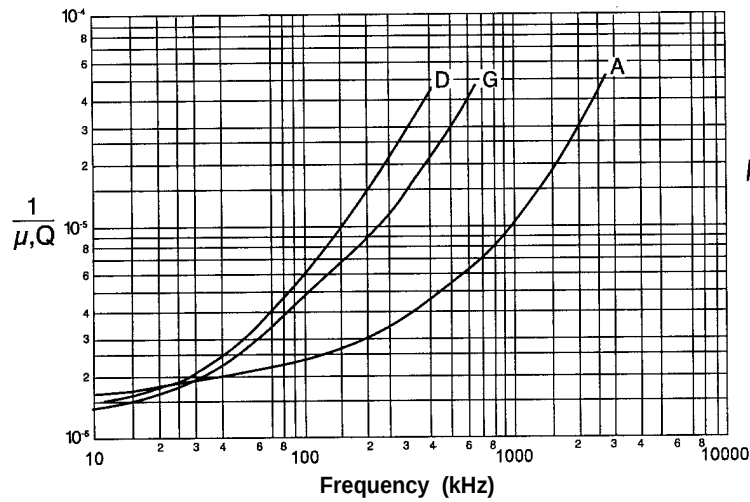
MATERIALS →			INDUCTORS AND LOW LEVEL APPLICATIONS			EMI/RFI FILTERS AND BROADBAND TRANSFORMERS		
			A	D	G	J	W	H
Initial Permeability	μ_i	—	750 ± 20%	2000 ± 20%	2300 ± 20%	5000 ± 20%	10000 ± 30%	15000 ± 30%
Maximum Usable Frequency (50% roll-off)	f	MHz	<9	<4	<4	<1	<.25	<.15
Relative Loss Factor	$\frac{\tan \delta}{\mu_{ac}}$	10 ⁻⁶	<12 (.5MHz) <20 (1MHz)	<6 (.1MHz)	<6 (.1MHz)	<20 (100kHz)	<7 (10kHz)	<15 (10kHz)
*Curie Temperature	T _c	°C	>260	>145	>180	>140	>125	>120
* Relative Temp. Factor - 30°C to +20°C + 20°C to +70°C	/°C	10 ⁻⁶ /°C	2.0 to 4.0 (Typ.) 1.0 to 3.0	.9 to 2.1 9 to 2.1	-. 7 to +.7			
*Flux Density @ 1194 A/m (15 Oe)	B _m	G mT	4600 460	3800 380	4600 460	4300 430	4300 430	4200 420
* Remanence	B _r	G mT	2300 230	1000 100	1300 130	1000 100	800 80	800 80
* Coercivity	H _c	Oe A/m	0.7 56	0.25 20	0.15 12	0.1 8	0.04 3	0.04 3
Disaccommodation Factor	D _F	10 ⁻⁶	<15	<2.0	<3.5	<3	<3	<2.5
* Resistivity	ρ	Ω-m	4	3	8	1	.15	.1
* Density	δ	g/cm ³	4.5	4.7	4.7	4.8	4.8	4.9
*Power Loss (P _L), Sine Wave, in mW/cm ² (typical)	25kHz 200mT (2000G)	@25°C @60°C @100°C @120°C						
	100kHz 100mT (1000G)	@25°C @60°C @100°C @120°C						
	500kHz 50mT (500G)	@25 °C @80°C @100 °C @120 °C	225 275 375					
	700kHz 50mT (500G)	@25°C @60°C @100°C @120°C						
Available in:	Pot Cores		X	X	X	X	X	
	RS Cores			X	X	X	X	
	DS Cores					X	X	
	RM Cores		X	X	X	X	X	
	EP Cores					X	X	
	E, U Cores					X	X	
	EC, ETD Cores							
	PQ Cores							
	Toroids		X	X	X	X	X	X
	Blocks					X		

NOTE (1). These characteristics are typical for a 42206 size (0.870" O.D.) toroid. Specific core data will usually differ from these numbers due to the influence of geometry and size. Characteristics with * are typical.

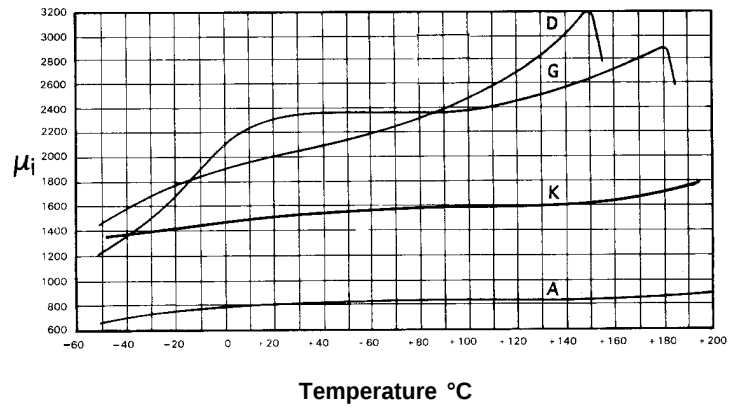
Material Characteristics (cont.) (1)

MATERIALS →			INDUCTORS AND POWER TRANSFORMERS			
			K	R	P	F
Initial Permeability	μ_i	—	1500 ± 25%	2300 ± 25%	2500 ± 25%	3000 ± 20%
Maximum Usable Frequency (50% roll-off)	f	MHz	<2	<1.5	<1.2	<1.3
Relative Loss Factor	$\frac{\tan \delta}{\mu_{\text{vac}}}$	10^{-6}				<8(100kHz)
*Curie Temperature	T _C	°C	>230	>230	>230	>250
*Relative Temp. Factor - 30°C to +20°C +20°C to +70°C	/°C	10 ⁶ /°C				
*Flux Density @ 1194 A/m (15 Oe)	B _m	G mT	4600 460	5000 500	5000 500	4900 490
*Remanence	B _r	G mT	900 90	1100 110	1100 110	1200 120
*Coercivity	H _C	Oe A/m	0.2 16	0.18 14	0.18 14	0.2 16
Disaccommodation Factor	D _F	10 ⁻⁶				
*Resistivity	ρ	Ω -m	20	6	5	2
*Density	δ	g/cm ³	4.7	4.8	4.8	4.8
* Power Loss (P _J), Sine Wave, in mW/cm ³ (typical)	25kHz 200mT (2000G)	@25°C @60°C @100°C @120°C		130 85 70 85	120 90 95 130	90 160 240
	100kHz 100mT (1000G)	@25°C @60°C @100°C @120°C	100 90 110 130	140 100 70 90	125 90 125 165	100 180 225
	500kHz 50mT (500G)	@25°C @60°C @100°C @120°C	100 100 120 140	375 300 250 300	300 250 275 350	
	700kHz 50mT (500G)	@25°C @60°C @100°C @120°C	180 200 220 290			
Available in:	Pot Cores		X	X	X	X
	RS Cores		X	X	X	X
	DS Cores		X	X	X	X
	RM Cores		X	X	X	X
	EP Cores		X	X	X	X
	E, U Cores		X	X	X	X
	EC, ETD Cores		X	X	X	X
	PQ Cores		X	X	X	X
	Toroids		X	X	X	X
	Blocks		X	X	X	

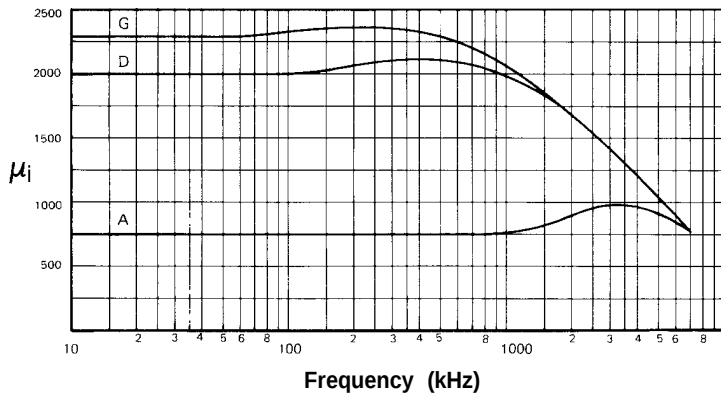
Graph 1 — Relative Loss Factor vs. Frequency



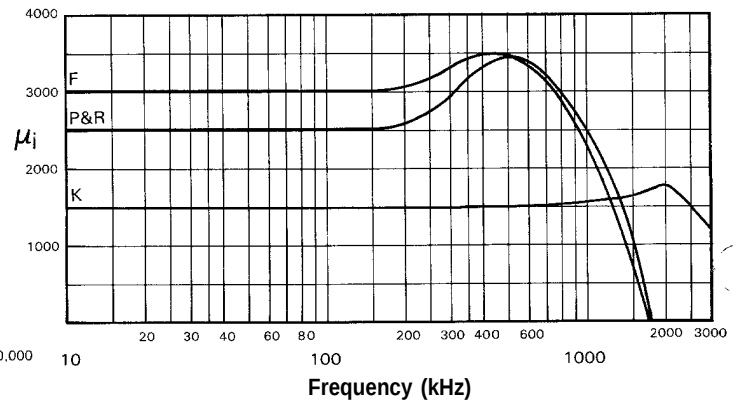
Graph 2 — Initial Permeability (μ_i) vs. Temperature



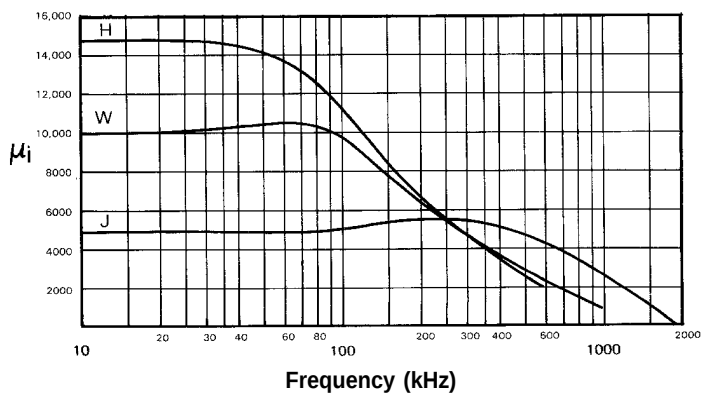
Graph 3A — Frequency Response Curves



Graph 3B — Frequency Response Curves



Graph 3C — Frequency Response Curves



W Material

μ_i 10,000 $\pm$ 30%
at 10 kHz

Saturation Flux Density - gauss 4300 (at 15 oersted, 25°C) (430 mT)

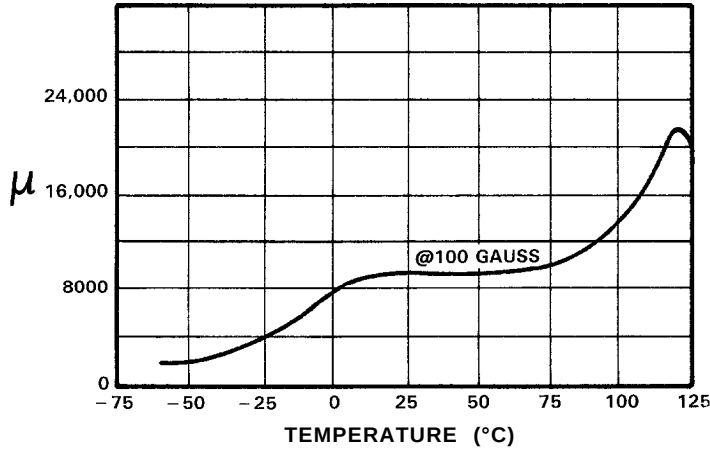
Coercive Force - oersted 0.04 (3A/m)

Curie Temperature 125°C

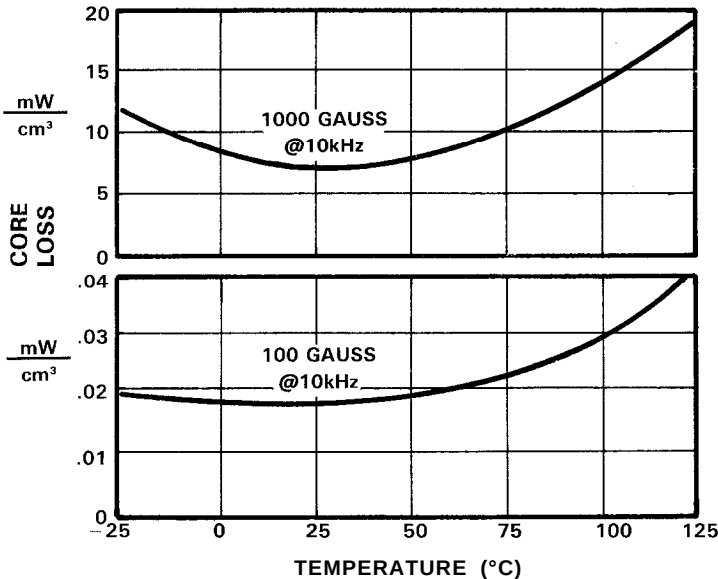
Disaccommodation Factor $<3 \times 10^{-6}$

Note: The core loss curves are developed from empirical data. For best results and highest accuracy, use them. The formula on page 2.11 yields a fair approximation and can be useful in computer programs.

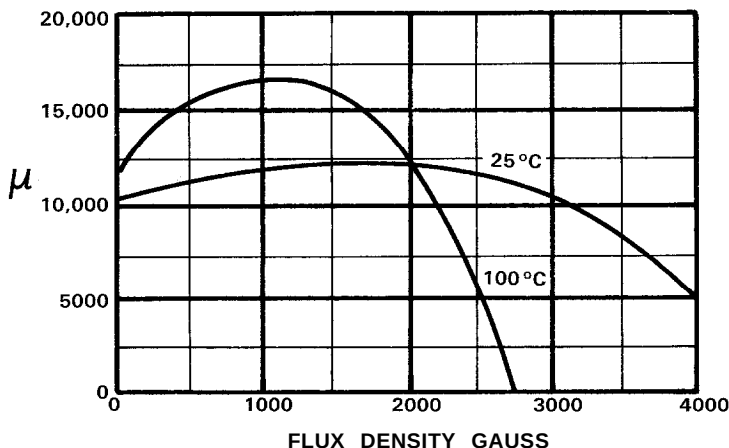
PERMEABILITY vs. TEMPERATURE



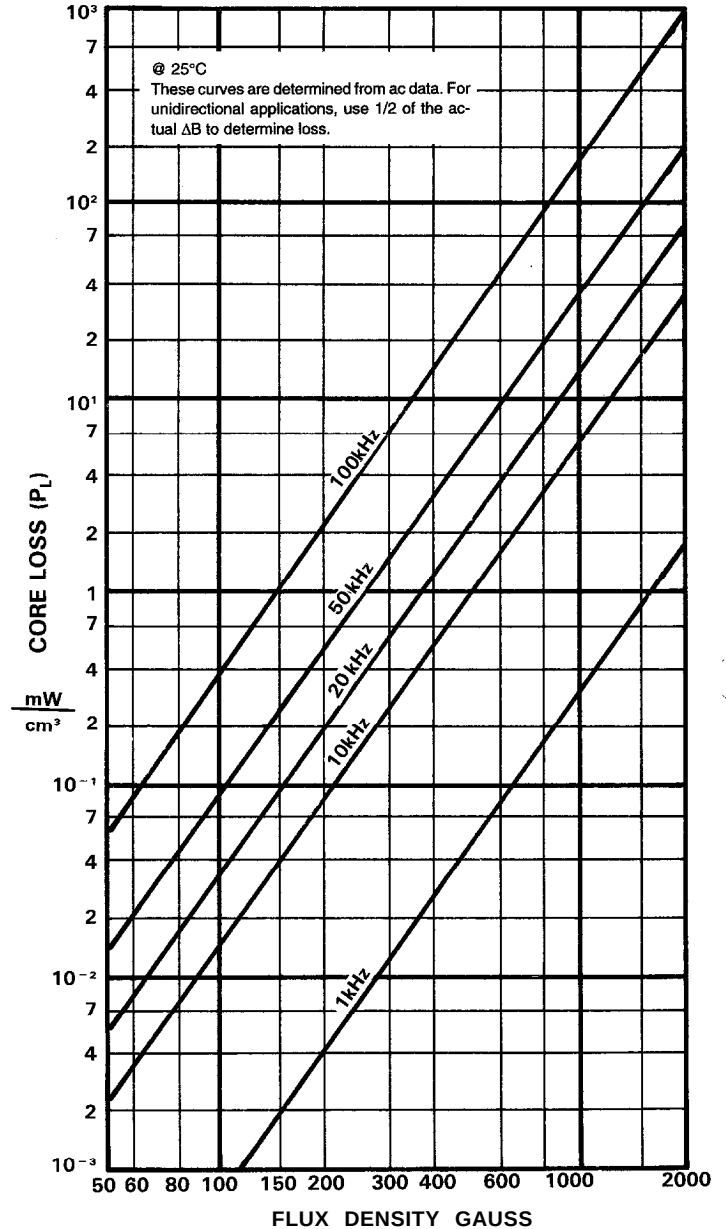
CORE LOSS vs. TEMPERATURE



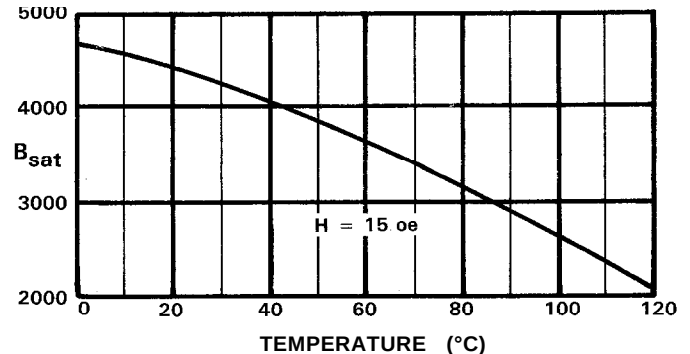
PERMEABILITY vs. FLUX DENSITY



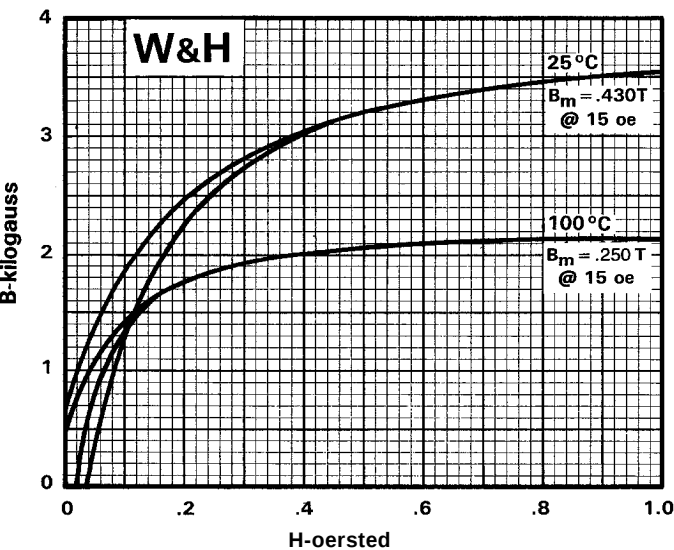
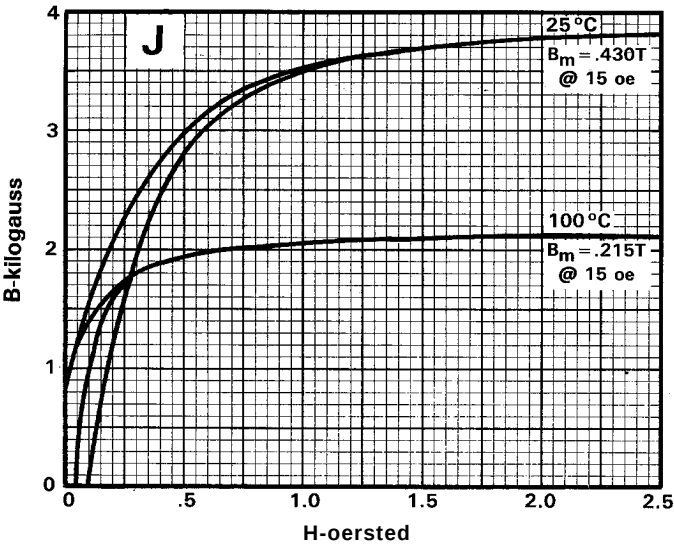
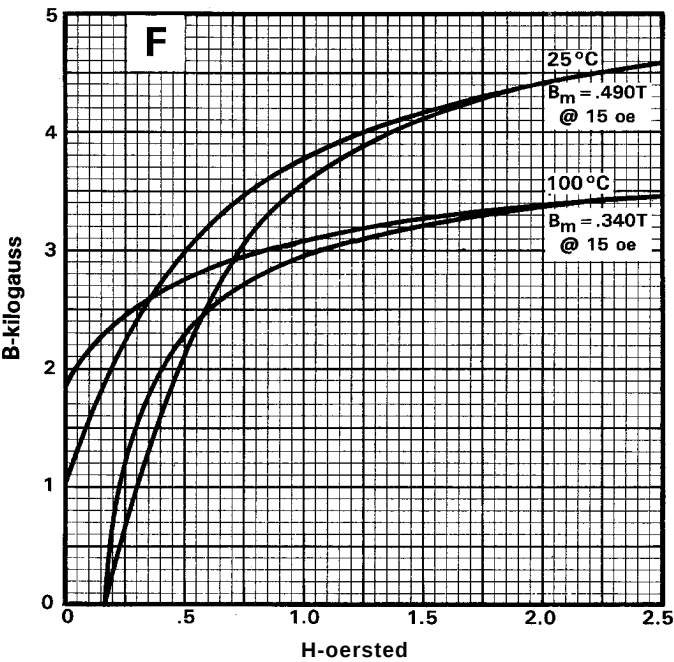
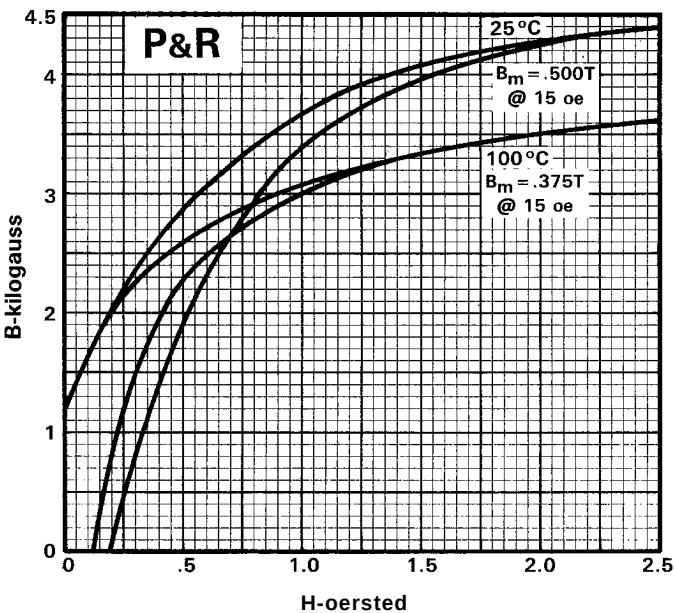
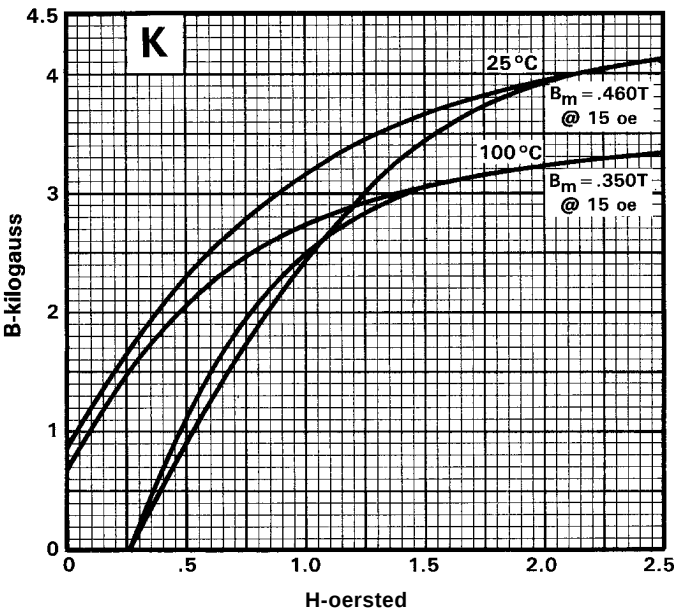
CORE LOSS vs. FLUX DENSITY



FLUX DENSITY vs. TEMPERATURE



B vs. H Curves (dc)



CONVERSION TABLE

Multiply number of	by	to obtain
Oersteds	79.5	A/m
Oersteds	.795	A/cm
Gausses	.1	milli Teslas
Gausses	10^{-4}	Teslas
Teslas	10^4	Gausses