IRON POWDER MATERIAL

MATERIAL #0 (μ=1):
Most commonly used for frequencies above 100 MHz. Available in toroidal form only. Note: Due to the nature of this material the inductance resulting from the use of the given AL value may not be as accurate as we would like. Inductance vs. number of turns will vary greatly depending upon the winding technique.

MATERIAL #1 (μ=20):
A Carbonyl 'C' material, very similar to material #3 except that it has higher volume resistivity and better stability. Available in toroidal form and shielded coil form.

MATERIAL #2 (μ=10):
A Carbonyl 'E' iron powder material having high volume resistivity. Offers high 'Q' for the 2 MHz to 30 MHz. frequency range. Available in toroidal form and shielded coil form.

MATERIAL #3 (μ=35):
A carbonyl 'HP' material having excellent stability and good 'Q' for the lower frequencies from 50 KHz. to 500 KHz. Available in toroidal form and shielded coil form.

MATERIAL #6 (μ=8):
A carbonyl 'SF' material. Offers very good 'Q' and temperature stability for the 20 MHz to 50 MHz frequency range. Available in both toroidal form and shielded coil form.

MATERIAL #7 (μ=9):
A carbonyl 'TH' material. Very similar to the #2 and #6 materials but offers better temperature stability than either. Available in both toroidal form and shielded coil form. Frequency ranges from 5 MHz to 35 MHz.

MATERIAL #10 (μ=6):
A powdered iron 'W' material. Offers good 'Q' and high stability for frequencies from 40 MHz to 100 MHz. Available in toroidal form and shielded coil form.

MATERIAL #12 (μ=4):
A synthetic oxide material which provides good 'Q' and moderate stability for frequencies from 50 MHz to 200 MHz. If high 'Q' is of prime importance this material is a good choice. If stability is of a prime importance, consider the #17 material. The #12 material is available in all sizes up to T-94, in toroidal form. Not available in shielded coil form.

MATERIAL #15 (μ=25):
A carbonyl 'GS6' material. Has excellent stability and good 'Q'. A good choice for commercial broadcast frequencies where good 'Q' and stability are essential. Available in toroidal form only.

MATERIAL #17 (μ=4):
This is a new carbonyl material which is very similar to the #12 material except that it has better temperature stability. However, as compared to the #12 material, there is a slight 'Q' loss of about 10 % from 50 MHz to 100 MHz. Above 100 MHz, the 'Q' will gradually deteriorate to approximately 20% lower. It is available in both toroidal form and the shielded coil form.

MATERIAL #26 (μ=75):
A Hydrogen Reduced material. Has highest permeability of all of the iron powder materials. Used for EMI filters and DC chokes. The #26 is very similar to the older #41 material but can provide an extended frequency range.

IRON POWDER TOROIDAL CORES (For Resonant Circuits)

MATERIAL 2	Permeabilty 10		Freq. Range 2 MHz - 30 MHz			Color - Red	
Core number	O.D. (inches)	I.D. (inches)	Hgt. (inches)	ℓ_e (cm)	A_e $(cm)^2$	V_e $(cm)^3$	A_L Value μh/100 turns
T-12-2	.125	.062	.050	.74	.010	.007	20
T-16-2	.160	.078	.060	.95	.016	.015	22
T-20-2	.200	.088	.070	1.15	.025	.029	25
T-25-2	.255	.120	.096	1.50	.042	.063	34
T-30-2	.307	.151	.128	1.83	.065	.119	43
T-37-2	.375	.205	.128	2.32	.070	.162	40
T-44-2	.440	.229	.159	2.67	.107	.286	52
T-50-2	.500	.303	.190	3.03	.121	.367	49
T-68-2	.690	.370	.190	4.24	.196	.831	57
T-80-2	.795	.495	.250	5.15	.242	1.246	55
T-94-2	.942	.560	.312	6.00	.385	2.310	84
T-106-2	1.060	.570	.437	6.50	.690	4.485	135
T-130-2	1.300	.780	.437	8.29	.730	6.052	110
T-157-2	1.570	.950	.570	10.05	1.140	11.457	140
T-184-2	1.840	.950	.710	11.12	2.040	22.685	240
T-200-2	2.000	1.250	.550	12.97	1.330	17.250	120
T-200A-2	2.000	1.250	1.000	12.97	2.240	29.050	218
T-225 -2	2.250	1.405	.550	14.56	1.508	21.956	120
T-225A-2	2.250	1.485	1.000	14.56	2.730	39.749	215
T-300 -2	3.058	1.925	.500	19.83	1.810	35.892	114
T-300A-2	3.048	1.925	1.000	19.83	3.580	70.991	228
T-400 -2	4.000	2.250	.650	24.93	3.660	91.244	180
T-400A-2	4.000	2.250	1.300	24.93	7.432	185.280	360
T-520 -2	5.200	3.080	.800	33.16	5.460	181.000	207

MATERIAL 3	Permeabilty 35		Freq. Range 0.05 MHz - 0.5 MHz			Color - Gray	
Core number	O.D. (inches)	I.D. (inches)	Hgt. (inches)	ℓ_e (cm)	A_e $(cm)^2$	V_e $(cm)^3$	A_L Value μh/100 turns
T-12-3	.125	.062	.050	.74	.010	.007	60
T-16-3	.160	.078	.060	.95	.016	.015	61
T-20-3	.200	.088	.070	1.15	.025	.029	76
T-25-3	.255	.120	.096	1.50	.042	.063	100
T-30-3	.307	.151	.128	1.83	.065	.119	140
T-37-3	.375	.205	.128	2.32	.070	.162	120
T-44-3	.440	.229	.159	2.67	.107	.286	180
T-50-3	.500	.303	.190	3.03	.121	.367	175
T-68-3	.690	.370	.190	4.24	.196	.831	195
T-80-3	.795	.495	.250	5.15	.242	1.246	180
T-94-3	.942	.560	.312	6.00	.385	2.310	248
T-106-3	1.060	.570	.437	6.50	.690	4.485	450
T-130-3	1.300	.780	.437	8.29	.730	6.052	350
T-157-3	1.570	.950	.570	10.05	1.140	11.457	420
T-184-3	1.840	.950	.710	11.12	2.040	22.685	720
T-200-3	2.000	1.250	.550	12.97	1.330	17.250	425
T-200A-3	2.000	1.250	1.000	12.97	2.240	29.050	460
T-225 -3	2.250	1.405	.550	14.56	1.508	21.956	425

Orders placed are shipped same day from stock.

IRON POWDER TOROIDAL CORES (For Resonant Circuits)

MATERIAL 6		Permeabilty 8		Freq. Range 10 MHz - 50 MHz			Color - Yellow
Core number	O.D. (inches)	I.D. (inches)	Hgt. (inches)	ℓ_e (cm)	A_e $(cm)^2$	V_e $(cm)^3$	A_L Value μh/100 turns
T-12-6	.125	.062	.050	.74	.010	.007	17
T-16-6	.160	.078	.060	.95	.016	.015	19
T-20-6	.200	.088	.070	1.15	.025	.029	22
T-25-6	.255	.120	.096	1.50	.042	.063	27
T-30-6	.307	.151	.128	1.83	.065	.119	36
T-37-6	.375	.205	.128	2.32	.070	.162	30
T-44-6	.440	.229	.159	2.67	.107	.286	42
T-50-6	.500	.303	.190	3.03	.121	.367	46
T-68-6	.690	.370	.190	4.24	.196	.831	47
T-80-6	.795	.495	.250	5.15	.242	1.246	45
T-94-6	.942	.560	.312	6.00	.385	2.310	70
T-106-6	1.060	.570	.437	6.50	.690	4.485	116
T-130-6	1.300	.780	.437	8.29	.730	6.052	96
T-157-6	1.570	.950	.570	10.05	1.140	11.457	115
T-184-6	1.840	.950	.710	11.12	2.040	22.685	195
T-200-6	2.000	1.250	.550	12.97	1.330	17.250	100
T-200A-6	2.000	1.250	1.000	12.97	2.240	29.050	180
T-225 -6	2.250	1.405	.550	14.56	1.508	21.956	100

MATERIAL 7		Permeabilty 9		Freq. Range 3 MHz - 35 MHz			Color - White
Core number	O.D. (inches)	I.D. (inches)	Hgt. (inches)	ℓ_e (cm)	A_e $(cm)^2$	V_e $(cm)^3$	A_L Value μh/100 turns
T-25-7	.255	.120	.096	1.50	.042	.063	29
T-37-7	.375	.205	.128	2.32	.070	.162	32
T-50-7	.500	.303	.190	3.03	.121	.367	43
T-68-7	.690	.370	.190	4.24	.196	.831	52

MATERIAL 10		Permeabilty 6		Freq. Range 30 MHz - 100 MHz			Color - Black
Core number	O.D. (inches)	I.D. (inches)	Hgt. (inches)	ℓ_e (cm)	A_e $(cm)^2$	V_e $(cm)^3$	A_L Value μh/100 turns
T-12-10	.125	.062	.050	.74	.010	.007	12
T-16-10	.160	.078	.060	.95	.016	.015	13
T-20-10	.200	.088	.070	1.15	.025	.029	16
T-25-10	.255	.120	.096	1.50	.042	.063	19
T-30-10	.307	.151	.128	1.83	.065	.119	25
T-37-10	.375	.205	.128	2.32	.070	.162	25
T-44-10	.440	.229	.159	2.67	.107	.286	33
T-50-10	.500	.303	.190	3.03	.121	.367	31
T-68-10	.690	.370	.190	4.24	.196	.831	32
T-80-10	.795	.495	.250	5.15	.242	1.246	32
T-94-10	.942	.560	.312	6.00	.385	2.310	58

All items listed in this CATALOG can usually be shipped immediately from stock.

SECTION II: FERRITE CORES

Ferrite Cores are available in numerous sizes and several permeabilities. Their permeability range is from 20 to more than 15,000. They are very useful for resonant circuit applications as well as wideband transformers and they are also commonly used for RFI attenuation. We can supply sizes from 0.23 inches to 2.4 inches in outer diameter directly from stock.

Ferrite toroidal cores are well suited for a variety of RF circuit applications and their relatively high permeability factors make them especially useful for high inductance values with a minimum number of turns, resulting in smaller component size.

There are two basic ferrite material groups: (1) Those having a permeability range from 20 to 800 μ_i are of the Nickel Zinc class, and (2) those having permeabilities above 800 μ_i are usually of the Manganese Zinc class.

The Nickel Zinc ferrite cores exhibit high volume resistivity, moderate temperature stability and high 'Q' factors for the 500 KHz to 100 MHz frequency range. They are well suited for low power, high inductance resonant circuits. Their low permeability factors make them useful for wide band transformer applications as well.

The Manganese Zinc ferrites, having permeabilities above 800 μ_i, have fairly low volume resistivity and moderate saturation flux density. They can offer high 'Q' factors for the 1 KHz to 1 MHz frequency range. Cores from this group of materials are widely used for switched mode power conversion transformers operating in the 20 KHz to 100 KHz frequency range. These cores are also very useful for the attenuation of unwanted RF noise signals in the frequency range of 20 MHz to 400 MHz and above.

A list of Ferrite toroids, including physical dimensions, A_L values, and magnetic properties will be found on the next few pages. Use the given A_L value and the equation below to calculate a turn count for a specific inductance.

$$N = 1000\sqrt{\frac{\text{desired 'L' (mh)}}{A_L\ \text{(mh/1000 turns)}}} \qquad L(\text{mh}) = \frac{A_L \times N^2}{1{,}000{,}000} \qquad A_L(\text{mh/1000 turns}) = \frac{1{,}000{,}000 \times \text{'L' (mh)}}{N^2}$$

N = number of turns L = inductance (mh) A_L = inductance index (mh)/1000 turns)

To improve voltage breakdown, coatings of ferrite cores are available for the F, J, W and H materials. Typical coatings are parylene C, Gray Coating and Black Lacquer. Parylene C coating has a thickness of 0.5 mils to 2 mils with a voltage breakdown of 750V. Gray coating has a thickness of 4 mils to 8 mils with voltage breakdown of 500V. Black Lacquer coating has a thickness of 0.5 mils to 2 mils with no increase in voltage breakdown.

All items in this booklet are standard stock items and usually can be shipped immediately. Call for availability of non-stock items.

- **For standard stocking items of Inductors, Chokes, Transformers and other wound ferrites, please see section V.**
- **For custom design of Inductors, Chokes, Transformers or Special Coil Windings, please call or fax your specifications today.**
- **Amidon provides engineering designs, prototyping and manufacturing. Low to high volume production capability with the most competitive pricing.**

FERRITE MATERIALS

MATERIAL 33 (μ = 850) A manganese-zinc material having low volume resistivity. Used for low frequency antennas in the 1 KHz to 1 MHz frequency range. Available in rod form only.

MATERIAL 43 (μ = 850) High volume resistivity. For medium frequency inductors and wideband transformers up to 50 MHz. Optimum frequency attenuation from 40 MHz to 400 MHz. Available in toroidal cores, shield beads, multi-aperture cores and special shapes for RFI suppression.

MATERIAL 61 (μ = 125) Offers moderate temperature stability and high 'Q' for frequencies 0.2 MHz to 15 MHz. Useful for wideband transformers to 200 MHz and frequency attenuation above 200 MHz. Available in toroids, rods, bobbins and multi-aperture cores.

MATERIAL 63 (μ = 40) For high 'Q' inductors in the 15 MHz to 25 MHz frequency range. Available in toroidal form only.

MATERIAL ~~64~~ (μ = 250) Primarily a bead material having high volume resistivity. Excellent temperature stability and very good shielding properties above 400 MHz.

MATERIAL 67 (μ = 40) Similar to the 63 material. Has greater saturation flux density and very good temperature stability. For high 'Q' inductors, (10 MHz to 80 Mhz). Wideband transformers to 200 MHz. Toroids only.

MATERIAL 68 (μ = 20) High volume resistivity and excellent temperature stability. For high Q' resonant circuits 80 MHz to 180 MHz. For high frequency inductors. Toroids only.

MATERIAL 73 (μ = 2500) Primarily a ferrite bead material. Has good attenuation properties from 1 MHz through 50 MHz. Available in beads and some broadband multi-aperture cores.

MATERIAL 77 (μ = 2000) Has high saturation flux density at high temperature. Low core loss in the 1 KHz to 1 MHz range. For low level power conversion and wideband transformers. Extensively used for frequency attenuation from 0.5 MHz to 50 MHz. Available in toroids, pot cores, E-cores, beads, broadband balun cores and sleeves. An upgrade of the former 72 material. The 72 material is still available in some sizes, but the 77 material should be used in all new design.

MATERIAL 'F' (μ = 3000) High saturation flux density at high temperature. For power conversion transformers. Good frequency attenuation 0.5 MHz to 50 MHz. Toroids only.

MATERIAL 'J'/75 (μ = 5000) Low volume resistivity and low core loss from 1 KHz to 1 MHz. Used for pulse transformers and low level wideband transformers. Excellent frequency attenuation from 0.5 MHz to 20 MHz. Available in toroidal form and ferrite beads as standard off the shelf in stock. Also available in pot cores, RM cores, E & U cores as custom ordered parts with lead time for delivery.

MATERIAL K (μ = 290). Used primarily in transmission line transformers from 1.0 MHz to 50 MHz range. Available from stock in a few sizes in toroidal form only.

MATERIAL W (μ = 10,000). High permeability material used for frequency attenuation from 100 KHz to 1 MHz in EMI/RFI filters. Also used in broadband transformers. Available in toroidal form from stock. As custom ordered parts for pot cores, EP cores, RM cores.

MATERIAL H (μ = 15,000). High permeability material used for frequency attenuation under 200 KHz. Also used in broadband transformers. Available in toroidal form only.

MAGNETIC PROPERTIES OF FERRITE MATERIALS

Material type	33	43	61	64	67	68	73
Initial Perm.	800	850	125	250	40	20	2500
Max. Perm.	1380	3000	450	375	125	40	4000
Max Flux den. @ 10 oer, (gauss)	2500	2750	2350	2200	3000	2000	4000
Residual Flux density, (gauss)	1350	1200	1200	1100	1000	1000	1000
Vol. Resist. (ohms-cm)	1×10^{2}	1×10^{5}	1×10^{8}	1×10^{8}	1×10^{7}	1×10^{7}	1×10^{2}
Temp. Coeff. -20°C - 70°C (%/°C)	.10%	1%	.15%	.15%	.13%	.06%	.80%
Loss Factor	3×10^{-6} @ .2 MHz	120×10^{-6} @ 1 MHz	32×10^{-6} @ 2.5 MHz	100×10^{-6} @ 2.5 MHz	150×10^{-6} @ 50 MHz	400×10^{-6} @ 0.1 MHz	7×10^{-6} @ 0.1 MHz
Coercive Force (Oersteds)	.30	.30	1.6	1.4	3.0	10.	.18
Curie Temp. °C	150	130	350	210	500	500	160
Resonant Cir. Freq. (MHz)	.01 to 1 MHz	.01 to 1 MHz	.20 to 10 MHz	.05 to 4 MHz	10 to 80 MHz	80 to 180 MHz	1 KHz to 1 MHz
Wideband Freq. (MHz *)	1 to 30 MHz	1 to 50 MHz	10 to 200 MHz	50 to 500 MHz	200 to 1000 MHz	.5 to 30 MHz	.2 to 15 MHz
Attenuation RF Noise, (MHz)	20 to 80 MHz	30 to 200 MHz	300 to 10,000 MHz	200 to 5,000 MHz	Above 1000 MHz	Above 10,000 MHz	1 to 40MHz

* Based on low power, small core application. Listed frequencies will be lower with higher power.

MAGNETIC PROPERTIES OF FERRITE MATERIALS

Material type	77	83	F	J	K	W	H
Initial Perm.	2000	300	3000	5000	290	10,000	15,000
Max. Perm.	6000	3600	4300	9500	400	20,000	23,000
Max Flux den. @ 10 oer, (gauss)	4600	3900	4700	4300	330	4300	4200
Residual Flux density, (gauss)	1150	3450	900	500	250	800	800
Vol. Resist. (ohms-cm)	1×10^2	1.5×10^3	1×10^2	1×10^2	20×10^7	$.15 \times 10^2$	$.1 \times 10^2$
Temp. Coeff. -20°C - 70°C (%/°C)	.25%	.4%	.25%	.4%	.15%	.4%	.4%
Loss Factor	4.5×10^{-6} @ 0.1 MHz	50×10^{-6} @ 0.1 MHz	4×10^{-6} @ 0.1 MHz	15×10^{-6} @ 0.1 MHz	28×10^{-6} @ 1 MHz	7×10^{-6} @ 10 KHz	15×10^{-6} @ 10 KHz
Coercive Force (Oersteds)	.22	.45	.20	.10	1	.04	.04
Curie Temp. °C	200	300	250	140	280	125	120
Resonant Cir. Freq. (MHz)	1 KHz to 2 MHz	1 KHz to 5 MHz	1 KHz to 1 MHz	1 KHz to 1 MHz	0.1 to 30 MHz	1 KHz to 250 KHz	1 KHz to 150 KHz
Wideband Freq. (MHz *)	.5 to 30 MHz	1 to 15 MHz	.5 to 30 MHz	1 to 15 MHz	50 to 500 MHz	1 KHz to 1 MHz	1KHz to 1 MHz
Attenuation RF Noise, (MHz)	1 to 40 MHz	0.5 to 20 MHz	1 to 20 MHz	0.5 to 10 MHz	200 to 5,000 MHz	100 KHz to 1 MHz	1 KHz to 500 KHz

* Based on low power, small core application. Listed frequencies will be lower with higher power.

FERRITE TOROIDAL CORES

Physical Dimensions - Ferrite Toroids						
Core Size	OD (inches)	ID (inches)	Hgt (inches)	Mean length (cm)	Cross Sect (cm2)	Volume (cm3)
FT-23	.230	.120	.060	1.34	.021	.029
FT-37	.375	.187	.125	2.15	.076	.163
FT-50	.500	.281	.188	3.02	.133	.401
FT-50 -A	.500	.312	.250	3.68	.152	.559
FT-50 -B	.500	.312	.500	3.18	.303	.963
FT-82	.825	.520	.250	5.26	.246	1.294
FT-87	.870	.540	.250	5.41	.261	1.414
FT-87 -A	.870	.540	.500	5.42	.315	1.710
FT-114	1.142	.750	.295	7.42	.375	2.783
FT-114-A	1.142	.750	.545	7.42	.690	5.120
FT-140	1.400	.900	.500	9.02	.806	7.270
FT-140A	1.400	.900	.590	9.00	.810	7.300
FT-150	1.500	.750	.250	8.30	.591	4.905
FT-150-A	1.500	.750	.500	8.30	1.110	9.213
FT-193	1.932	1.250	.625	12.31	1.360	16.742
FT-193-A	1.932	1.250	.750	12.31	1.620	19.942
FT-240	2.400	1.400	.500	14.40	1.570	22.608

A_L Values (mH/1000 turns) - Ferrite Toroids For complete part number add mix number to core size below									
Material >	43	61	63	67	68	75	77	F	J
core size	μ=850	μ=125	μ=40	μ=40	μ=20	μ=5000	μ=2000	μ=3000	μ=5000
FT-23 ( )	188	24.8	7.9	7.8	4.0	990	356	NA	NA
FT-37 ( )	420	55.3	17.7	17.7	8.8	2210	796	NA	NA
FT-50 ( )	523	68.0	22.0	22.0	11.0	2750	990	NA	NA
FT-50A- ( )	570	75.0	24.0	24.0	12.0	2990	1080	NA	NA
FT-50B- ( )	1140	150.0	48.0	48.0	12.0	NA	2160	NA	NA
FT-82 ( )	557	73.3	22.4	22.4	11.7	3020	1060	NA	NA
FT-87 ( )	NA	NA	NA	NA	NA	NA	NA	180	3020
FT-87A- ( )	NA	NA	NA	NA	NA	NA	NA	3700	6040
FT-114 ( )	603	79.3	25.4	25.4	12.7	3170	1140	1902	3170
FT-114A ( )	NA	146.0	NA	NA	NA	NA	NA	NA	NA
FT-140- ( )	952	140.0	45.0	45.0	NA	6736	2340	NA	6736
FT-150- ( )	NA	NA	NA	NA	NA	NA	NA	2640	* 4400
FT-150A ( )	NA	NA	NA	NA	NA	NA	NA	5020	8370
FT-193- ( )	NA	NA	NA	NA	NA	NA	NA	* 3640	* 6065
FT-193A ( )	NA	NA	NA	NA	NA	NA	NA	4460	7435
FT-240 ( )	1240	173.0	53.0	53.0	NA	6845	3130	NA	6845