SECTION I: IRON POWDER CORES

Iron Powder Cores are made in numerous shapes and sizes: such as Toroidal Cores, E-cores, Shielded Coil Forms, Sleeves etc., each of which is available in many different materials. There are two basic groups of iron powder material: (1) The Carbonyl Iron and, (2) The Hydrogen Reduced Iron.

The Carbonyl Iron cores are especially noted for their stability over a wide range of temperatures and flux levels. Their permeability range is from less than 3 μ_i to 35 μ_i and can offer excellent 'Q' factors from 50 KHz to 200 MHz. They are ideally suited for a variety of RF applications where good stability and good 'Q' are essential. Also, they are very much in demand for broadband inductors, especially where high power is concerned.

The Hydrogen Reduced Iron cores have higher permeabilities ranging from 35 μ_i to 90 μ_i. Somewhat lower 'Q' can be expected from this group of cores. They are mainly used for EMI filters and low frequency chokes. They are also very much in demand for input and output filters for switched mode power supplies.

The next several pages are devoted to iron powder materials and the toroidal core configuration in particular. You will find physical dimensions of available items, their A_L values and other magnetic properties, as well as how to select the proper core for your application.

In general, toroidal cores are the most efficient of any core configuration. They are highly self-shielding since most of the flux lines are contained within the core. The flux lines are essentially uniform over the entire length of the magnetic path and consequently stray magnetic fields will have very little effect on a toroidal inductor. It is seldom necessary to shield a toroidal inductor.

The A_L value of each iron powder core can be found in the charts on the next several pages. Use this A_L value and the formula below to calculate the number of turns for a specific inductance.

$$N = 100\sqrt{\frac{\text{desired 'L' } (\mu h)}{A_L\ (\mu h/100 \text{ turns})}} \qquad L(\mu h) = \frac{A_L \times N^2}{10{,}000} \qquad A_L(\mu h/100 \text{ turns}) = \frac{10{,}000 \times \text{'L' } (\mu h)}{N^2}$$

N = number of turns   L = inductance (μh) A_L = inductance index (μh)/100 turns)

Please see section IV on "Toroid Mounts & E-Core Bobbins" for information on mounting toroids to PC Boards. Amidon also provides complete wound and mounted cores.

- **For standard wound toroid, please see section V.**
- **For custom inductors based on your specifications, please call or fax today. You will be assured of prompt response with quotations in less than 72 hours.**
- **Amidon provides low cost manual and automated coil windings. Please call for more information.**

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 0		Permeabilty 1		Freq. Range 100 MHz - 300 MHz		Color - Tan	
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-12-0	.125	.062	.050	.74	.010	.007	3.0
T-16-0	.160	.078	.060	.95	.016	.015	3.0
T-20-0	.200	.088	.070	1.15	.025	.029	3.5
T-25-0	.255	.120	.096	1.50	.042	.063	4.5
T-30-0	.307	.151	.128	1.83	.065	.119	6.0
T-37-0	.375	.205	.128	2.32	.070	.162	4.9
T-44-0	.440	.229	.159	2.67	.107	.286	6.5
T-50-0	.500	.303	.190	3.03	.121	.367	6.4
T-68-0	.690	.370	.190	4.24	.196	.831	7.5
T-80-0	.795	.495	.250	5.15	.242	1.246	8.5
T-94-0	.942	.560	.312	6.00	.385	2.310	10.6
T-106-0	1.060	.570	.437	6.50	.690	4.485	19.0
T-130-0	1.300	.780	.437	8.29	.730	6.052	15.0

Note: Due to the nature of the '0' material, the inductance resulting from the use of the given A_L value may vary greatly depending upon the winding technique. This may cause discrepancy between calculated and measured inductance.

MATERIAL 1		Permeabilty 20		Freq. Range 0.5 MHz - 5 MHz		Color - Blue	
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-12-1	.125	.062	.050	.74	.010	.007	48
T-16-1	.160	.078	.060	.95	.016	.015	44
T-20-1	.200	.088	.070	1.15	.025	.029	52
T-25-1	.255	.120	.096	1.50	.042	.063	70
T-30-1	.307	.151	.128	1.83	.065	.119	85
T-37-1	.375	.205	.128	2.32	.070	.162	80
T-44-1	.440	.229	.159	2.67	.107	.286	105
T-50-1	.500	.303	.190	3.03	.121	.367	100
T-68-1	.690	.370	.190	4.24	.196	.831	115
T-80-1	.795	.495	.250	5.15	.242	1.246	115
T-94-1	.942	.560	.312	6.00	.385	2.310	160
T-106-1	1.060	.570	.437	6.50	.690	4.485	325
T-130-1	1.300	.780	.437	8.29	.730	6.052	200
T-157-1	1.570	.950	.570	10.05	1.140	11.457	320
T-184-1	1.840	.950	.710	11.12	2.040	22.685	500
T-200-1	2.000	1.250	.550	12.97	1.330	17.250	250

Note: Most cores can be very useful well below the lower frequency limit shown above.

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	40
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.

IRON POWDER TOROIDAL CORES (For Resonant Circuits)

MATERIAL 12		Permeabilty 4		Freq. Range 50 MHz - 200 MHz		Color - Green & 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-12-12	.125	.062	.050	.74	.010	.007	7.5
T-16-12	.160	.078	.060	.95	.016	.015	8.0
T-20-12	.200	.088	.070	1.15	.025	.029	10.0
T-25-12	.255	.120	.096	1.50	.042	.063	12.0
T-30-12	.307	.151	.128	1.83	.065	.119	16.0
T-37-12	.375	.205	.128	2.32	.070	.162	15.0
T-44-12	.440	.229	.159	2.67	.107	.286	18.5
T-50-12	.500	.303	.190	3.03	.121	.367	18.0
T-68-12	.690	.370	.190	4.24	.196	.831	21.0
T-80-12	.795	.495	.250	5.15	.242	1.246	22.0
T-94-12	.942	.560	.312	6.00	.385	2.310	32.0

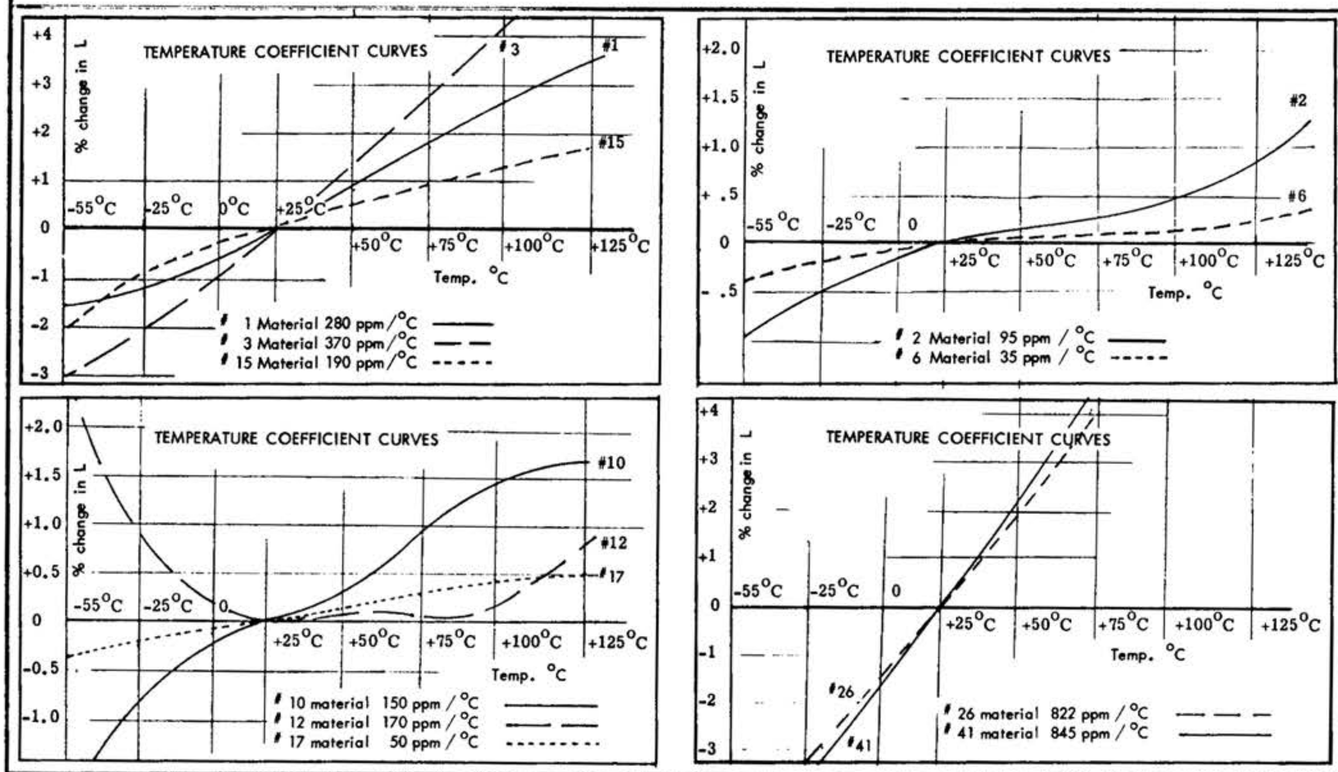
Note: The #17 material offers greater temperature stability than #12 materials, but #12 material can provide higher 'Q'.

MATERIAL 15		Permeabilty 25		Freq. Range 0.1 MHz - 2. MHz		Color - Red & 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-12-15	.125	.062	.050	.74	.010	.007	50
T-16-15	.160	.078	.060	.95	.016	.015	55
T-20-15	.200	.088	.070	1.15	.025	.029	65
T-25-15	.255	.120	.096	1.50	.042	.063	85
T-30-15	.307	.151	.128	1.83	.065	.119	93
T-37-15	.375	.205	.128	2.32	.070	.162	90
T-44-15	.440	.229	.159	2.67	.107	.286	160
T-50-15	.500	.303	.190	3.03	.121	.367	135
T-68-15	.690	.370	.190	4.24	.196	.831	180
T-80-15	.795	.495	.250	5.15	.242	1.246	170
T-94-15	.942	.560	.312	6.00	.385	2.310	200
T-106-15	1.060	.570	.437	6.50	.690	4.485	345
T-130-15	1.300	.780	.437	8.29	.730	6.052	250
T-157-15	1.570	.950	.570	10.05	1.140	11.457	360

MATERIAL 17		Permeabilty 4		Freq. Range 20 MHz - 200 MHz		Color - Blue & 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-12-17	.125	.062	.050	.75	.010	.008	7.5
T-16-17	.160	.078	.060	.93	.015	.0141	8.0
T-20-17	.200	.088	.070	1.15	.025	.026	10.0
T-25-17	.255	.120	.096	1.50	.042	.055	12.0
T-30-17	.307	.151	.128	1.83	.065	.110	16.0
T-37-17	.375	.205	.128	2.30	.070	.147	15.0
T-44-17	.440	.229	.159	2.67	.107	.266	18.5
T-50-17	.500	.303	.190	3.03	.121	.358	18.0
T-68-17	.690	.370	.190	4.24	.196	.759	21.0
T-80-17	.795	.495	.250	5.14	.231	1.190	22.0
T-90-17	.942	.560	.312	6.00	.385	2.310	32.0

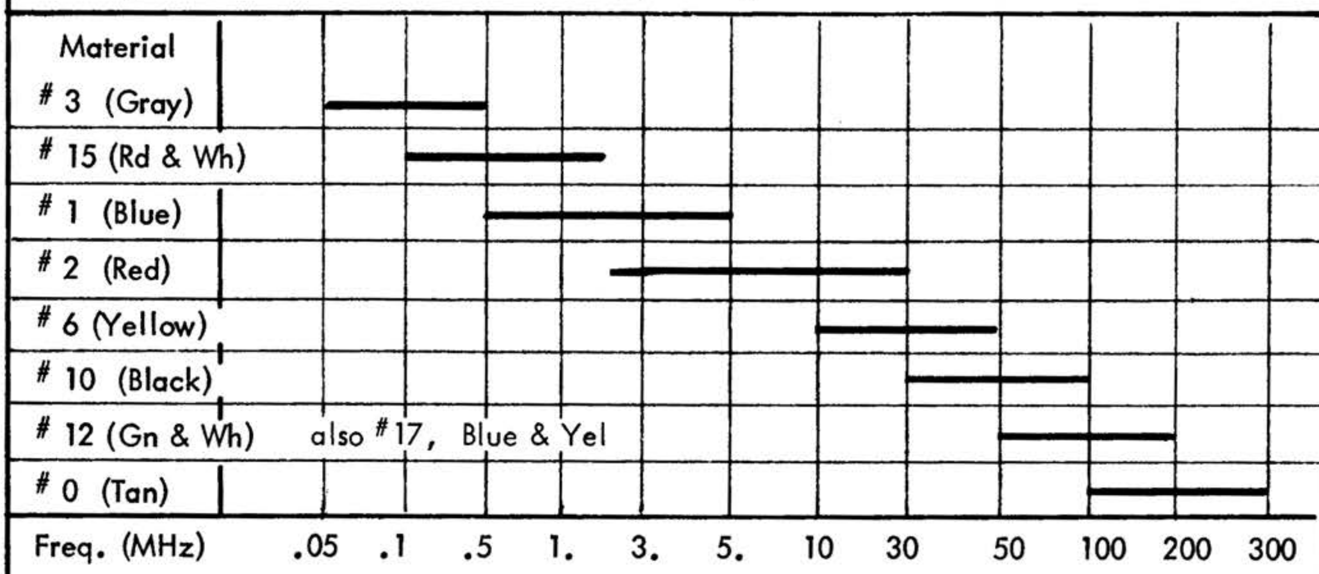
MATERIAL 26 See AC Line Filter and DC Choke section.

TEMPERATURE COEFFICIENT CHARTS



IRON - POWDER MATERIAL vs. FREQUENCY RANGE

Higher Q will be obtained in the upper portion of a materials frequency range when smaller cores are used. Likewise, in the lower portion of a materials frequency range, higher Q can be achieved when using the larger cores.



240 Briggs Avenue, Costa Mesa, California, U.S.A. • TEL. (714) 850-4660 • FAX. (714) 850-1163

IRON POWDER TOROIDAL CORES

Physical Dimension											
Core	OD (in)	ID (in)	HGT (in)	Mean lgth. (cm)	Cross sect. (cm^2)	Core	OD (in)	ID (in)	HGT (in)	Mean lgth. (cm)	Cross sect. (cm^2)
T- 12	.125	.062	.050	.75	.010	T-130	1.30	.78	.437	8.29	.73
T- 16	.160	.078	.060	.95	.016	T-157	1.57	.95	.570	10.05	1.14
T- 20	.200	.088	.070	1.15	.025	T-184	1.84	.95	.710	11.12	2.04
T- 25	.250	.120	.096	1.50	.042	T-200	2.00	1.25	.550	12.97	1.33
T- 30	.307	.151	.128	1.83	.065	T-200A	2.00	1.25	1.000	12.97	2.42
T- 37	.375	.205	.128	2.32	.070	T-225	2.25	1.40	.550	14.56	1.50
T- 44	.440	.229	.159	2.67	.107	T-225A	2.25	1.40	1.000	14.56	2.73
T- 50	.500	.300	.190	3.20	.121	T-300	3.00	1.92	.500	19.83	1.81
T- 68	.690	.370	.190	4.24	.196	T-300A	3.00	1.92	1.000	19.83	3.58
T- 80	.795	.495	.250	5.15	.242	T-400	4.00	2.25	.650	24.93	3.66
T- 94	.942	.560	.312	6.00	.385	T-400A	4.00	2.25	1.000	24.93	7.43
T-106	1.060	.570	.437	6.50	.690	T-500	5.20	3.08	.800	33.16	5.46

A_L Values (µh/100 turns)

For complete part number, add Mix number to Core Size number.

Core Size	26 Mix Yel-Wh μ=75 Pwr Frq	3 Mix Gray μ=35 .05 -0.5	15 Mix Rd-Wh μ=25 0.1 - 2.	1 Mix Blue μ=20 0.5 - 5.	2 Mix Red μ=10 2 - 30	7 Mix White μ=9 1 - 25	6 Mix Yellow μ=8 10 - 50	10 Mix Black μ=6 30-100	12 Mix Grn-Wh μ=4 50-200	17 Mix Bl/Ylw μ=4 40-180	0 Mix Tan μ=1 100-300
Mhz											
T- 12-	na	60	50	48	20	18	17	12	7.5	7.5	3.0
T- 16-	145	61	55	44	22	na	19	13	8.0	8.0	3.0
T- 20-	180	76	65	52	25	24	22	16	10.0	10.0	3.5
T- 25-	235	100	85	70	34	29	27	19	12.0	12.0	4.5
T- 30-	325	140	93	85	43	37	36	25	16.0	16.0	6.0
T- 37-	275	120	90	80	40	32	30	25	15.0	15.0	4.9
T- 44-	360	180	160	105	52	46	42	33	18.5	18.5	6.5
T- 50-	320	175	135	100	49	43	40	31	18.0	18.0	6.4
T- 68-	420	195	180	115	57	52	47	32	21.0	21.0	7.5
T- 80-	450	180	170	115	55	50	45	32	22.0	22.0	8.5
T- 94-	590	248	200	160	84	na	70	58	32.0	na	10.6
T-106-	900	450	345	325	135	133	116	na	na	na	19.0
T-130-	785	350	250	200	110	103	96	na	na	na	15.0
T-157-	970	420	360	320	140	na	115	na	na	na	na
T-184-	1640	720	na	500	240	na	195	na	na	na	na
T-200-	895	425	na	250	120	105	100	na	na	na	na
T-200A-	1550	760	na	na	218	na	180	na	na	na	na
T-225-	950	424	na	na	120	na	100	na	na	na	na
T-225A-	1600	na	na	na	215	na	na	na	na	na	na
T-300-	800	na	na	na	114	na	na	na	na	na	na
T-300A-	1600	na	na	na	228	na	na	na	na	na	na
T-400-	1300	na	na	na	185	na	na	na	na	na	na
T-400A-	2600	na	na	na	360	na	na	na	na	na	na
T-520-	1460	na	na	na	207	na	na	na	na	na	na

na - not available.

COPPER WIRE TABLE

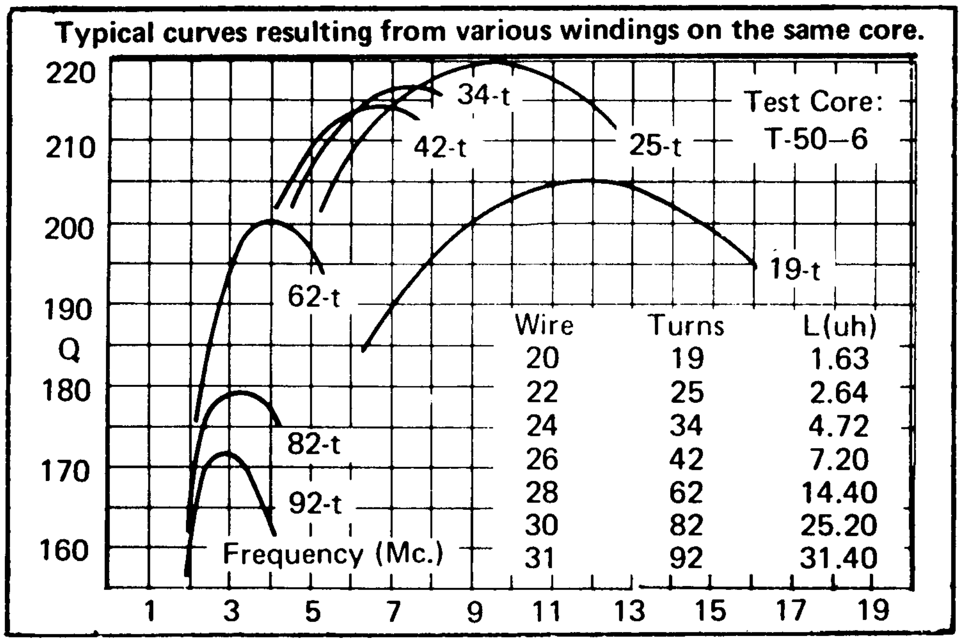
Wire size AWG	Diameter in inches (enamel)	Circular mil area	Turns per linear inch	Turns per sq.cm	Continuous duty current (amp) single wire, open air	Continuous duty, (amp) conduit or in wire bundles
8	.1285	16510	7.6		73	46.0
10	.1019	10380	10.7	13.8	55	33.0
12	.0808	6530	12.0	21.7	41	23.0
14	.0640	4107	15.0	34.1	32	17.0
16	.0508	2583	18.9	61.2	22	13.0
18	.0403	1624	23.6	79.1	16	10.0
20	.0319	1022	29.4	124.0	11	7.5
22	.0253	642	37.0	186.0	—	5.0
24	.0201	404	46.3	294.0	—	—
26	.0159	254	58.0	465.0	—	—
28	.0126	160	72.7	728.0	—	—
30	.0100	101	90.5	1085.0	—	—
32	.0079	63	113.0	1628.0	—	—
34	.0063	40	141.0	2480.0	—	—
36	.0050	25	175.0	3876.0	—	—
38	.0039	16	224.0	5736.0	—	—
40	.0031	10	382.0	10077.0	—	—

IRON POWDER CORE SIZE vs. TURNS and WIRE SIZE

Approximate number of turns for full single layer winding

Awg wire	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Core Size																
T-12	0	0	0	1	1	1	2	4	5	8	11	15	21	29	37	47
T-16	0	0	1	1	1	3	3	5	8	11	16	21	29	38	49	63
T-20	0	1	1	1	3	4	5	6	9	14	18	25	33	43	56	72
T-25	1	1	1	3	4	5	7	11	15	21	28	37	48	62	79	101
T-30	1	1	3	4	5	7	11	15	21	28	37	48	62	78	101	129
T-37	1	3	5	7	9	12	17	23	31	41	53	67	87	110	140	177
T-44	3	5	6	7	10	15	20	27	35	46	60	76	97	124	157	199
T-50	5	6	8	11	16	21	28	37	49	63	81	103	131	166	210	265
T-68	7	9	12	15	21	28	36	47	61	79	101	127	162	205	257	325
T-80	8	12	17	23	30	39	51	66	84	108	137	172	219	276	347	438
T-94	10	14	20	27	35	45	58	75	96	123	156	195	248	313	393	496
T-106	10	14	20	27	35	45	58	75	96	123	156	195	248	313	393	496
T-130	17	23	30	40	51	66	83	107	137	173	220	275	348	439	550	693
T-157	22	29	38	50	64	82	104	132	168	213	270	336	426	536	672	846
T-184	22	29	38	50	64	82	104	132	168	213	270	336	426	536	672	846
T-200	31	41	53	68	86	109	139	176	223	282	357	445	562	707	886	1115
T-225	36	46	60	77	98	123	156	198	250	317	400	499	631	793	993	1250
T-300	52	66	85	108	137	172	217	274	347	438	553	688	870	1093	1368	1721
T-400	61	79	100	127	161	202	255	322	407	513	648	806	1018	1278	1543	2013
T-520	86	110	149	160	223	279	349	443	559	706	889	1105	1396	1753	2192	2758

TYPICAL 'Q' CURVES
various windings, same core

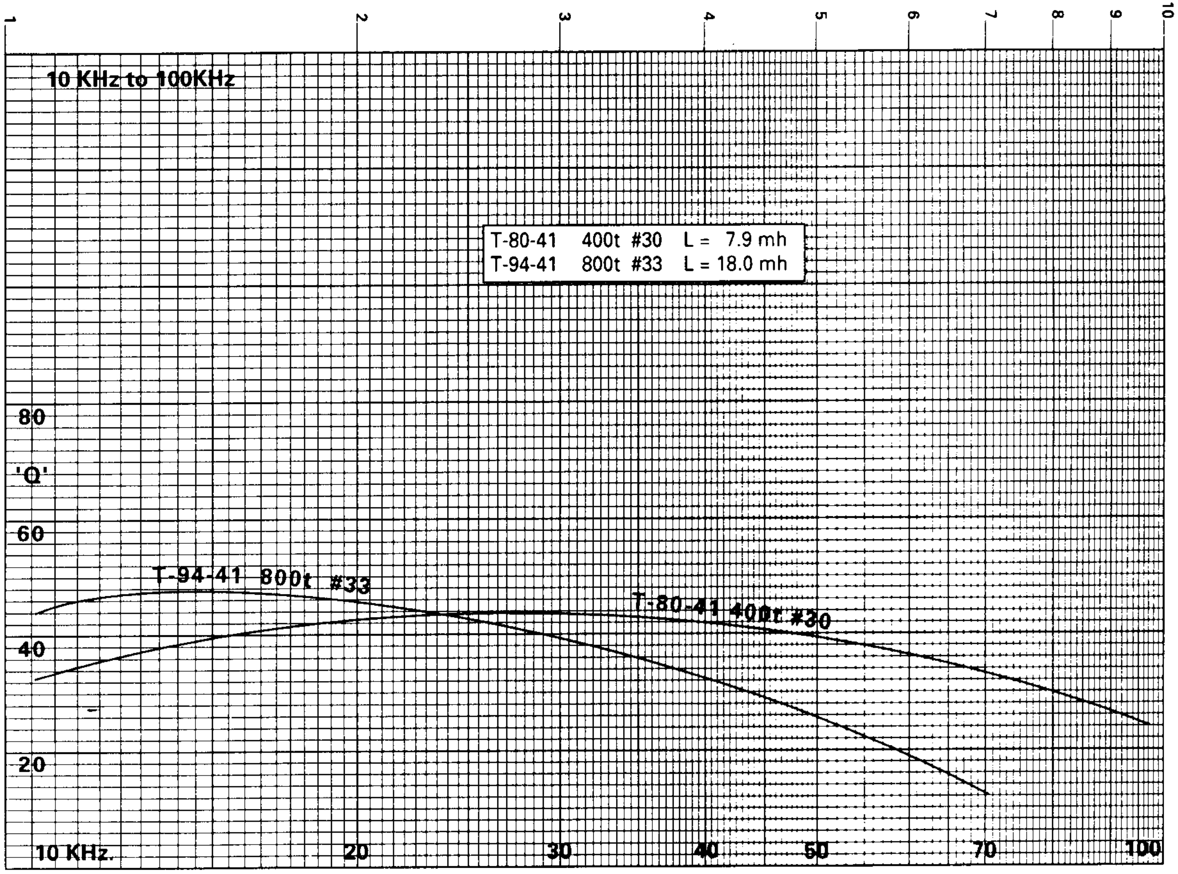


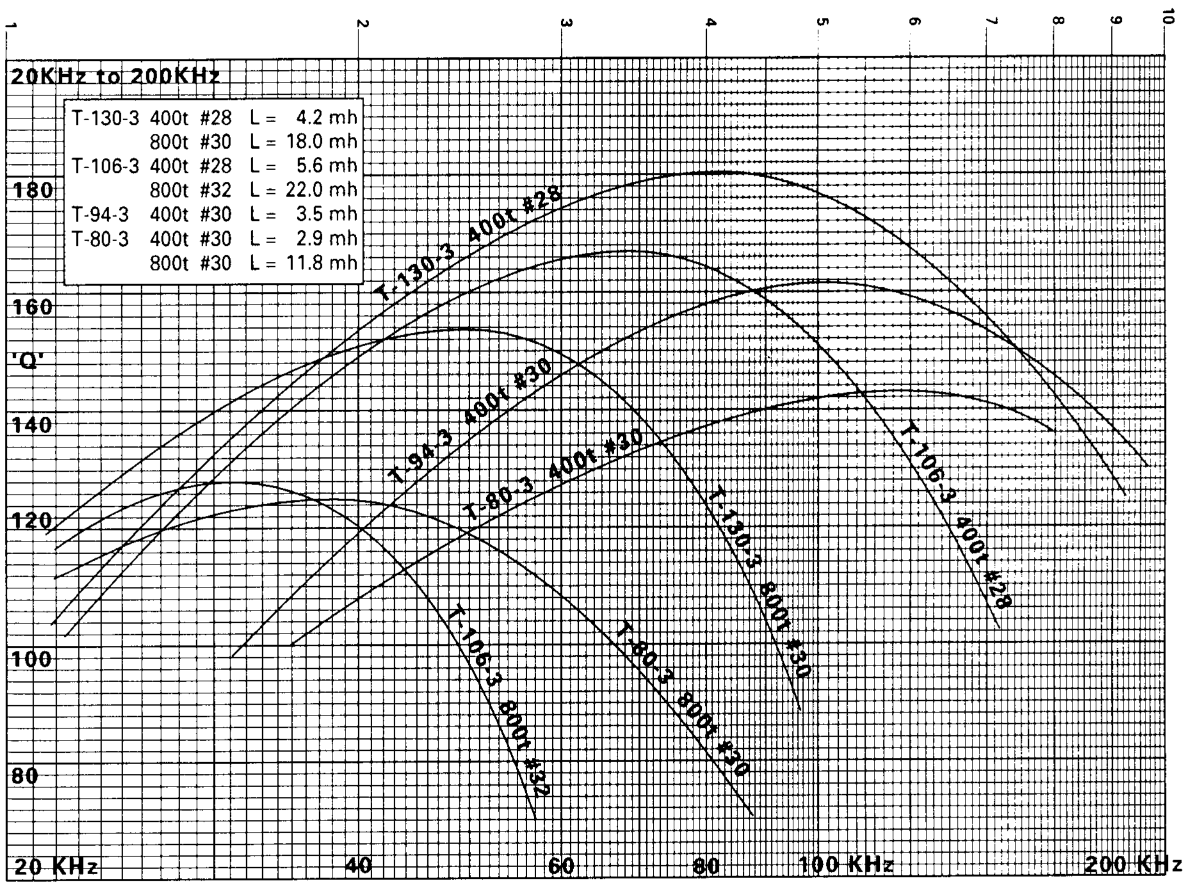
The above chart shows typical Q curves resulting from a number of various windings on the same toroidal core.

The next several pages contain a number of Q curves which were measured and plotted from actual windings.

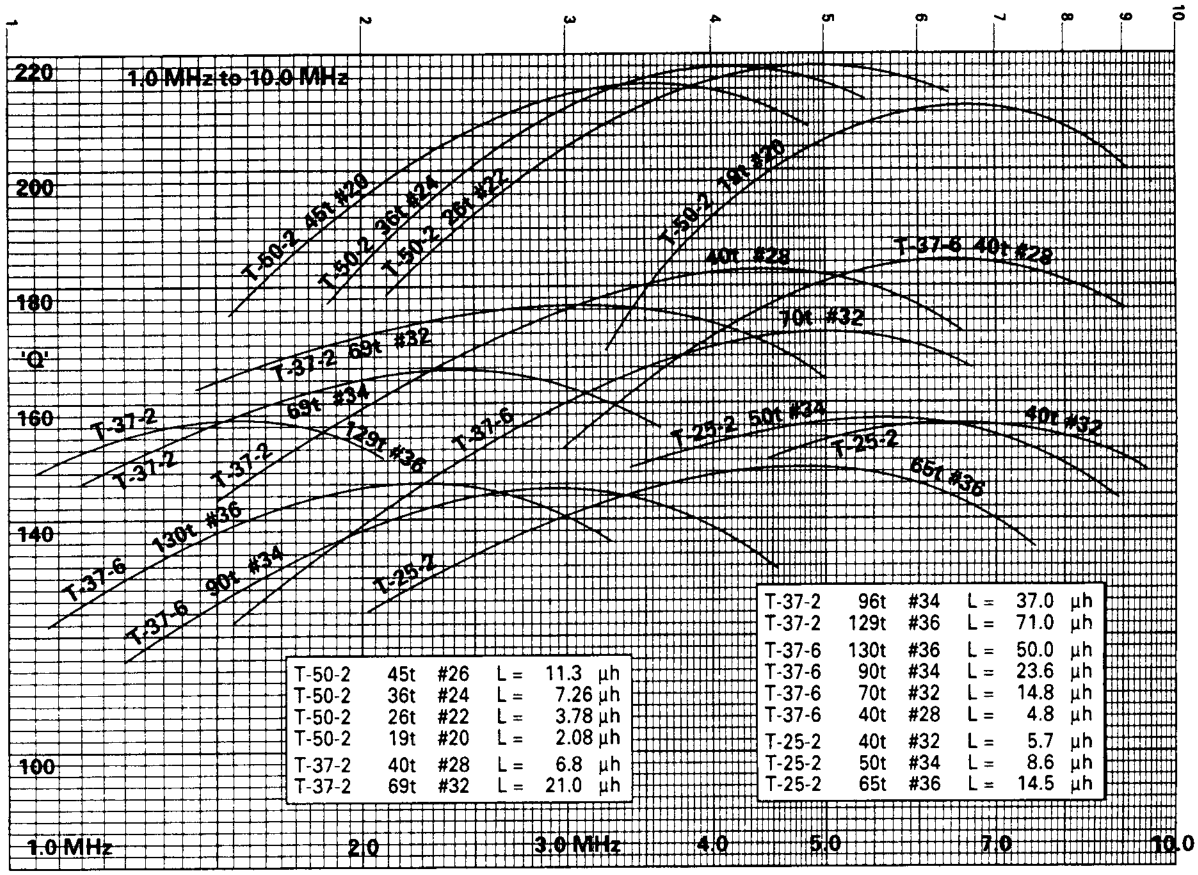
Inductance charts are given later on in this booklet which will help you choose a core for a specific inductance. Since the charts are in increments of ten turns, a more precise turns-count can be calculated with the turns vs. inductance equation once the core has been selected.

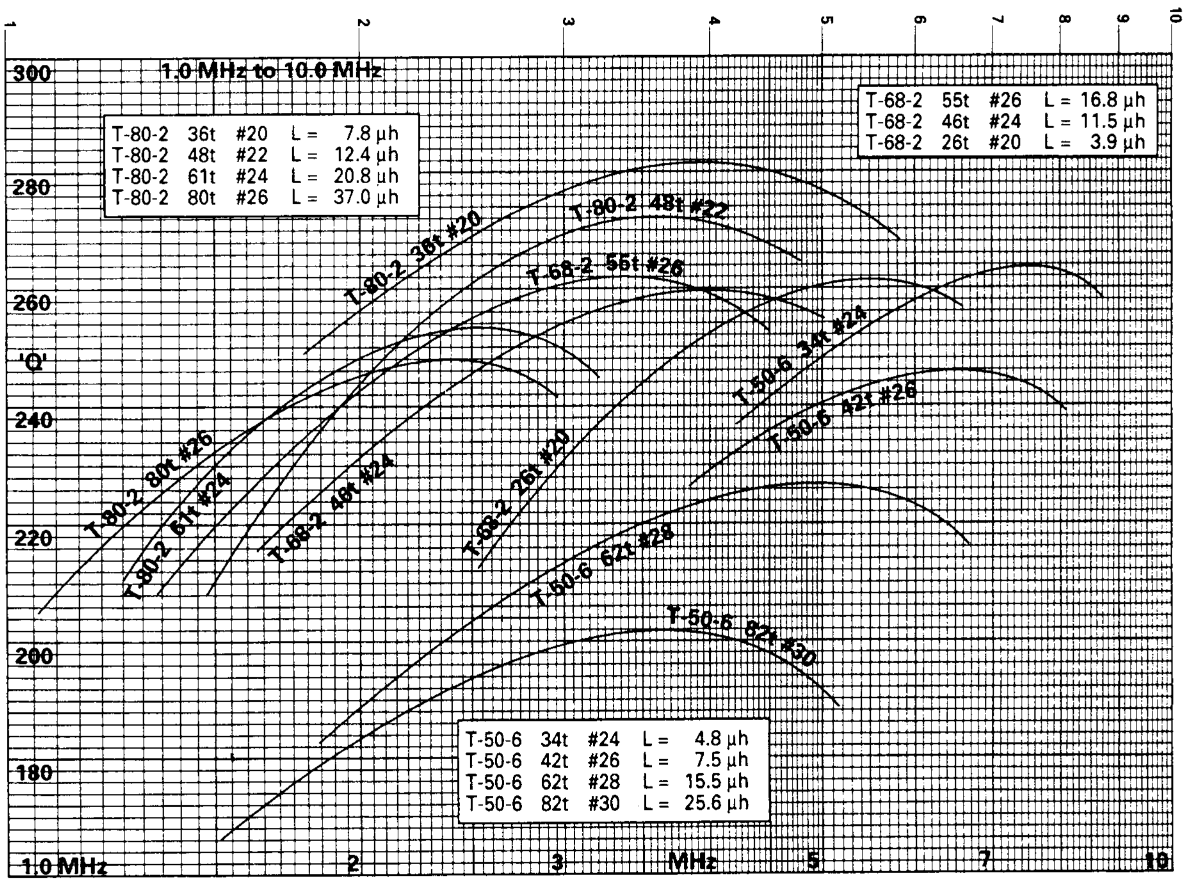
IRON-POWDER TOROIDAL CORES Q-CURVES





IRON-POWDER TOROIDAL CORES — Q-CURVES





INDUCTANCE CHARTS (Iron Powder Toroids)

IRON POWDER TOROIDAL CORES

MATERIAL #0 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	.19	.76	1.70	3.0	4.8	6.8	9.3	12.0	15.0	19.0	23	27	32	37
T-94	.10	.40	.90	1.7	2.7	3.8	5.2	6.8	8.6	10.0	13	15	18	21
T-80	.08	.34	.77	1.4	2.1	3.0	4.2	5.4	6.9	8.5	10	12	14	-
T-68	.07	.30	.67	1.2	1.9	2.7	3.7	4.8	6.0	7.5	-	-	-	-
T-50	.06	.26	.57	1.0	1.6	2.3	3.1	4.1	-	-	-	-	-	-
T-37	.05	.20	.44	.7	1.2	-	-	-	-	-	-	-	-	-
T-25	.04	.18	.41	-	-	-	-	-	-	-	-	-	-	-
T-20	.03	.14	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.03	.12	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.03	-	-	-	-	-	-	-	-	-	-	-	-	-

IRON POWDER TOROIDAL CORES

MATERIAL #1 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	3.2	13.0	29	52	81	117	159	208	263	325	393	468	549	637
T-94	1.6	6.4	14	25	40	57	78	102	130	160	194	230	270	304
T-80	1.2	4.6	10	18	28	41	56	73	93	115	139	166	194	-
T-68	1.2	4.6	10	18	28	41	56	73	93	115	139	166	194	-
T-50	1.0	4.0	9	16	25	36	49	64	-	-	-	-	-	-
T-37	.8	3.2	7	13	20	-	-	-	-	-	-	-	-	-
T-25	.7	2.8	6	-	-	-	-	-	-	-	-	-	-	-
T-20	.5	2.0	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.4	1.7	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.4	-	-	-	-	-	-	-	-	-	-	-	-	-

IRON POWDER TOROIDAL CORES

MATERIAL #2 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	1.4	5	12	22	34	49	66	86	109	135	163	194	228	265
T-94	.8	3	8	13	21	30	41	54	68	84	101	120	131	142
T-80	.6	2	5	9	14	20	27	35	45	55	66	79	93	-
T-68	.6	2	5	9	15	21	29	38	48	59	-	-	-	-
T-50	.5	2	2	8	12	18	24	31	-	-	-	-	-	-
T-37	.4	2	4	6	10	-	-	-	-	-	-	-	-	-
T-25	.3	1	3	-	-	-	-	-	-	-	-	-	-	-
T-20	.3	1	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.2	-	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.1	-	-	-	-	-	-	-	-	-	-	-	-	-

INDUCTANCE CHARTS (Iron Powder Toroids)

IRON POWDER TOROIDAL CORES

MATERIAL #3 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	5	18	41	72	113	182	221	288	365	450	545	648	761	882
T-94	2	10	22	40	62	89	121	159	200	248	300	357	419	486
T-80	2	7	16	29	45	65	88	115	146	180	218	259	304	-
T-68	3	8	18	31	49	70	96	125	158	185	-	-	-	-
T-50	2	7	16	26	44	63	86	112	-	-	-	-	-	-
T-37	1	5	9	-	-	-	-	-	-	-	-	-	-	-
T-25	1	4	9	-	-	-	-	-	-	-	-	-	-	-
T-20	.9	4	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.6	2	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.6	-	-	-	-	-	-	-	-	-	-	-	-	-

IRON POWDER TOROIDAL CORES

MATERIAL #6 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	1.1	5.0	10	19	30	42	57	74	94	116	140	167	196	227
T-94	.7	3.0	6	11	18	25	34	45	57	70	85	100	118	137
T-80	.5	2.0	4	7	11	16	22	29	36	45	54	64	76	-
T-68	.5	2.0	4	7	11	17	23	30	38	47	-	-	-	-
T-50	.4	2.0	3	6	10	14	20	26	-	-	-	-	-	-
T-37	.4	1.0	3	5	7	-	-	-	-	-	-	-	-	-
T-25	.3	1.0	2	-	-	-	-	-	-	-	-	-	-	-
T-20	.2	.8	1	-	-	-	-	-	-	-	-	-	-	-
T-16	.2	-	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.1	-	-	-	-	-	-	-	-	-	-	-	-	-

IRON POWDER TOROIDAL CORES

MATERIAL #10 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-94	.6	2	5	9	15	21	28	37	47	58	70	84	98	113
T-80	.3	1	3	5	8	12	16	21	27	33	40	48	54	-
T-68	.3	1	2	5	8	12	16	20	26	32	-	-	-	-
T-50	.3	1	3	5	8	11	15	20	-	-	-	-	-	-
T-37	.3	1	2	4	6	-	-	-	-	-	-	-	-	-
T-25	.2	.8	2	-	-	-	-	-	-	-	-	-	-	-
T-20	.1	.6	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.1	.5	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.1	-	-	-	-	-	-	-	-	-	-	-	-	-

INDUCTANCE CHARTS (Iron Powder Toroids)

IRON POWDER TOROIDAL CORES

MATERIAL #15 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	4	14	31	55	86	124	169	221	279	345	417	497	583	676
T-94	2	8	18	32	50	72	98	128	162	200	242	288	338	392
T-80	2	7	15	27	43	61	83	109	138	170	206	245	287	-
T-68	2	7	16	29	45	65	88	115	146	180	-	-	-	-
T-50	1	5	12	22	34	49	66	86	-	-	-	-	-	-
T-37	1	4	8	14	23	-	-	-	-	-	-	-	-	-
T-25	1	3	8	-	-	-	-	-	-	-	-	-	-	-
T-20	.5	3	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.5	3	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.5	-	-	-	-	-	-	-	-	-	-	-	-	-

IRON POWDER TOROIDAL CORES

MATERIAL #17 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-94	.3	1	3	5	8	12	16	20	30	32	39	46	54	63
T-80	.2	.8	2	4	6	6	11	14	18	22	27	32	37	-
T-68	.2	.8	2	3	5	7	10	13	17	21	-	-	-	-
T-50	.2	.7	2	3	5	7	9	12	-	-	-	-	-	-
T-37	.1	.6	1	2	4	-	-	-	-	-	-	-	-	-
T-25	.1	.5	1	-	-	-	-	-	-	-	-	-	-	-
T-20	.1	.4	-	-	-	-	-	-	-	-	-	-	-	-
T-16	.08	.3	-	-	-	-	-	-	-	-	-	-	-	-
T-12	.07	-	-	-	-	-	-	-	-	-	-	-	-	-

IRON POWDER TOROIDAL CORES

MATERIAL #26 Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Size														
T-106	9	36	81	144	245	324	441	576	729	900	089	1296	1521	1764
T-94	6	24	53	94	148	212	289	378	478	590	714	850	997	1156
T-80	5	18	41	72	113	162	221	288	365	450	545	648	761	882
T-68	4	17	38	67	105	151	206	269	340	420	508	605	710	823
T-50	3	13	29	51	80	115	157	205	259	320	387	461	541	627
T-37	2.7	11	25	44	69	135	176	223	-	-	-	-	-	-

INDUCTANCE CHART

LARGE SIZE IRON POWDERS

LARGE CORES Inductance (μh) vs. Size, Material and Number of Turns

Turns	10	20	30	40	50	60	70	80	90	100	110	120	130
Core Number													
T-400A-26	26	104	324	416	650	936	1274	1664	2106	2600	3146	3744	4394
T-400A-2	4	14	32	57	90	130	176	230	292	360	436	518	608
T-400-26	13	53	119	211	330	475	646	845	1069	1320	1597	1900	2231
T-400-2	2	7	17	27	46	67	91	118	150	185	224	266	313
T-300A-26	16	64	144	256	400	576	784	1024	1296	1600	1936	2304	2704
T-300A-2	2	9	20	36	57	82	118	146	185	228	276	328	385
T-300-26	8	33	74	132	06	297	404	528	668	825	998	188	1394
T-300-2	1	5	10	18	29	41	56	74	93	115	139	166	194
T-225A-26	16	64	144	256	400	576	784	1024	1296	1600	1936	2304	2704
T-225A-2	2	9	19	34	54	77	105	138	174	215	276	310	385
T-225-26	10	38	86	152	238	342	466	608	770	950	1150	1368	1607
T-225-2	1	5	11	19	30	43	59	79	97	120	145	173	203
T-225-3	4	17	38	68	106	153	208	272	344	425	514	612	718
T-225-6	1	4	9	16	25	36	49	64	81	100	121	144	169
T-200A-26	16	62	136	248	388	558	760	992	1256	1550	1875	2418	2619
T-200A-1	5	18	41	73	114	164	223	291	369	455	551	655	764
T-200A-2	2	9	19	35	55	78	107	140	177	218	264	314	368
T-200A-3	5	18	41	74	115	165	225	294	373	460	557	662	777
T-200A-6	2	7	16	29	45	65	88	115	146	180	218	259	304
T-200-26	9	36	81	143	224	322	439	573	725	895	1082	1289	1513
T-200-1	3	10	23	40	63	90	123	160	203	250	303	360	423
T-200-2	1	5	11	19	30	43	59	79	97	120	145	173	203
T-200-3	4	17	38	68	106	153	208	272	344	425	514	612	718
T-200-6	1	4	9	16	25	36	49	64	81	100	121	144	169
T-184-26	16	66	148	262	410	590	804	1049	1328	1640	1984	2362	2772
T-184-1	5	20	45	80	125	180	245	320	405	500	605	720	845
T-184-2	2	10	22	38	60	86	118	154	194	240	290	396	406
T-184-3	7	29	65	115	180	259	353	461	583	720	871	1039	1217
T-184-6	2	8	18	31	49	70	96	125	158	195	236	281	330
T-157-26	10	34	87	155	243	349	475	621	786	970	1174	1397	1639
T-157-1	3	13	29	51	80	115	157	205	259	320	387	461	541
T-157-2	1	6	13	22	35	50	69	90	113	140	169	202	237
T-157-3	4	17	38	67	105	151	206	269	340	420	508	605	710
T-157-6	1	5	10	18	29	41	56	74	93	115	139	166	194
T-157-15	4	14	32	58	90	130	176	230	292	360	436	518	608
T-130-26	8	31	71	126	196	283	385	502	636	785	950	1130	1327
T-130-1	2	8	18	32	50	72	98	128	162	200	242	288	334
T-130-2	1	4	10	18	28	40	54	70	89	110	133	158	186
T-130-3	4	13	36	56	88	127	172	224	284	350	424	504	592
T-130-6	1	4	9	15	24	35	47	61	78	96	116	138	162
T-130-15	3	10	23	40	63	90	123	160	203	250	303	360	423

IRON POWDER TOROIDAL CORES

FOR
DC CHOKES and AC LINE FILTERS

For many years Iron Powder has been used as the core material for RF inductors and transformers when stability and high 'Q' are of primary concern. Because of the growing need for energy storage inductors for noise filtering, new materials have been developed for these applications

High 'Q' inductors are no longer required, in fact low 'Q' actually helps in damping high frequency oscillations. The #26 Iron Powder material is ideally suited for these applications since it combines low 'Q', good frequency response, and high energy capabilities.

Energy storage , expressed in microjoules, is calculated by multiplying one-half the inductance in μh times the current in amperes squared. The amount of energy that can be stored in a given inductor is limited either by saturation of the core material or temperature rise of the wound unit, resulting in copper loss and/or core loss.

In typical DC chokes, the AC ripple flux is normally small in comparison to the DC component. Since the DC flux does not generate core loss, our primary concern becomes saturation and copper loss. The DC saturation characteristics of the #26 material are shown in Fig. A on the following page.

Using this information, DC energy storage curves have been developed and presented in the chart on the 2nd following page. A table of energy storage limits vs. temperature rise is included in the chart. The table at the bottom of the page is for single layer winding.

In 60 Hz. line filter applications, the high frequency to be filtered falls into two categories: (1) Common-mode noise and (2) Differential-mode noise. The common-mode noise is in relation to earth ground and is common to both lines. Differential mode noise is the noise between the two lines.

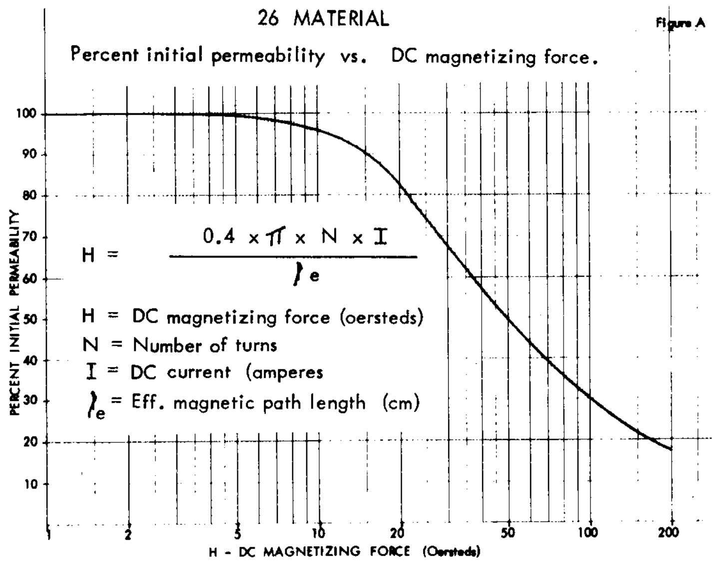
The Common-mode noise filter is usually constructed on a high permeability ferrite type core with a bifilar type winding. This type of winding allows the 60 Hz. flux generated by each line to cancel within the core, thus avoiding saturation. If the #26 Iron Powder material were to be used, the large core size necessary to accommodate the required number of wire turns for the required inductance makes this option unattractive.

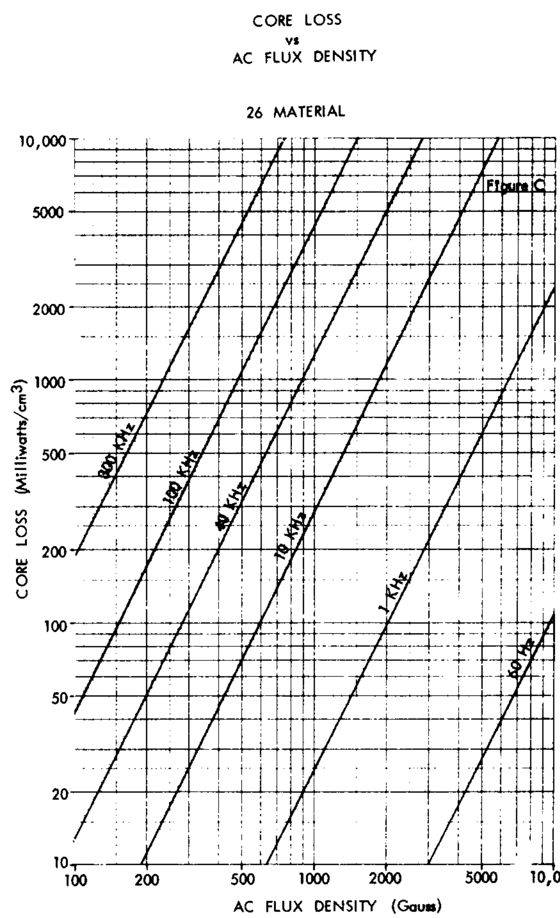
The Differential-mode filters must be able to support a significant amount of 60 Hz. flux without saturating. The AC saturation characteristics of the #26 material (Fig. B) and core loss information (Fig. C) can be seen on the following page. Notice how the permeability initially increases with AC excitation. This effect allows greater energy storage in 60 Hz. applications.

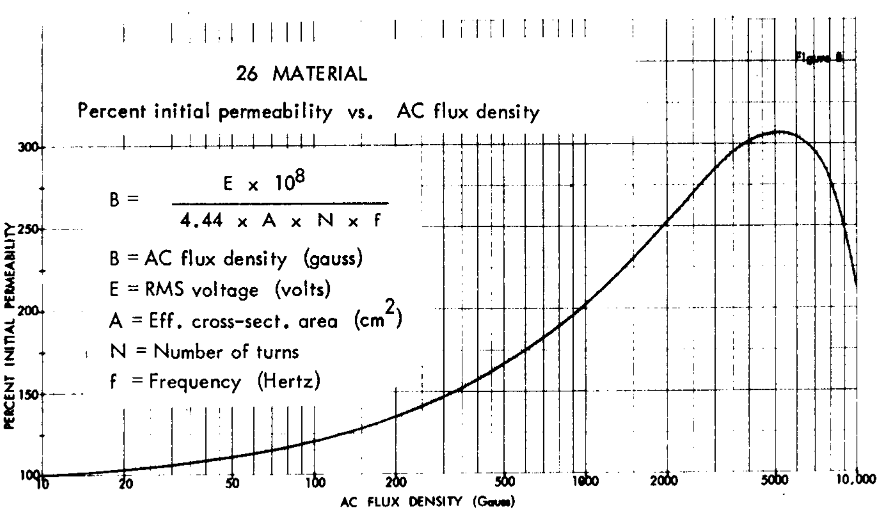
Energy storage curves have been developed for line filter applications as shown on the 3rd following page. The energy storage limit table is now taking into account both the core and the copper loss. In order to guarantee a minimum inductance over a wide current range, the design engineer may wish to calculate the required turns based on the listed A_L value of the core.

CORES FOR DC CHOKES AND AC LINE FILTERS

MATERIAL 26		Permeabilty 75		DC to 1 MHz (Low 'Q')		Color - Yellow & 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-30-26	.307	.151	.128	1.83	.065	.119	325
T-37-26	.375	.205	.128	2.32	.070	.162	275
T-44-26	.440	.229	.159	2.67	.107	.286	360
T-50-26	.500	.303	.190	3.03	.121	.367	320
T-68-26	.690	.370	.190	4.24	.196	.831	420
T-80-26	.795	.495	.250	5.15	.242	1.246	450
T-94-26	.942	.560	.312	6.00	.385	2.310	590
T-106-26	1.060	.570	.437	6.50	.690	4.485	900
T-130-26	1.300	.780	.437	8.29	.730	6.052	785
T-157-26	1.570	.950	.570	10.05	1.140	11.457	970
T-184-26	1.840	.950	.710	11.12	2.040	22.685	1640
T-200-26	2.000	1.250	.550	12.97	1.330	17.250	895
T-200A-26	2.000	1.250	1.000	12.97	2.240	29.050	1525
T-225-26	2.250	1.405	.550	14.56	1.508	21.956	950
T-225A-26	2.250	1.485	1.000	14.56	2.730	39.749	1600
T-300-26	3.058	1.925	.500	19.83	1.810	35.892	800
T-300A-26	3.048	1.925	1.000	19.83	3.580	70.991	1600
T-400-26	4.000	2.250	.650	24.93	3.660	91.244	1300
T-400A-26	4.000	2.250	1.300	24.93	7.432	185.280	2600
T-520-26	5.200	3.080	.800	33.16	5.460	181.000	1460







POWER CONSIDERATIONS (Iron Powder and Ferrite)

How large a core is needed to handle a certain amount of power? This is a question often asked. Unfortunately, there is no simple answer.

There are several factors involved such as: cross sectional area of the core, core material, turns count, and of course the variables of applied voltage and operating frequency.

Overheating of the coil will usually take place long before saturation in most applications above 100 KHz. Now the question becomes 'How large a core must I have to prevent overheating at a given frequency and power level'?

Overheating can be caused by both wire and core material losses. Wire heating is affected by both DC and AC currents, while core heating is affected only by the AC content of the signal. With a normal sinewave signal above 100 KHz, both the Iron Powder and Ferrite type cores will first be affected by overheating caused by core losses, rather than saturation.

The extrapolated AC flux density limits (see table below) can be used for BOTH Iron Powder and Ferrite type cores as a guideline to avoid excessive heating. These figures may vary slightly according to the type of the material being used.

Operating frequency is one of the most important factors concerning power capability above 100 KHz. A core that works well at 2 MHz. may very well burn up at 30 MHz. with the same amount of drive.

Core saturation, a secondary cause of coil failure, is affected by both AC and DC signals. Saturation will decrease the permeability of the core causing it to have impaired performance or to become inoperative. The safe operating total flux density level for most Ferrite materials is typically 2000 gauss, while Iron Powder materials can tolerate up to 5000 gauss without significant saturation effects.

Iron Powder cores (low permeability) are superior to the Ferrite material cores for high power inductors for this reason: fewer turns will be required by the Ferrite type core for a given inductance. When the same voltage drop is applied across a decreased number of turns, the flux density will increase accordingly. In order to prevent the flux density from increasing when fewer turns are used, the flux drive will have to be decreased.

Either core material can be used for transformer applications but both will have 'trade-offs'. Ferrite type cores will require fewer turns, will give more impedance per turn and will couple better, whereas the Iron Powder cores will require more turns, will give less impedance per turn, will not couple as well but will tolerate more power and are more stable.

Frequency:	100 KHz	1 MHz	7 MHz	14 MHz	21 MHz	28 MHz
AC Flux Den.	500 gauss	150 gauss	57 gauss	42 gauss	36 gauss	30 gauss

The equation for determining the maximum flux density of a given toroidal core is as follows:

$$B_{max} = \frac{E \times 10^8}{4.44 \times A_e \times N \times F}$$

E_{pk} = applied RMS volts

A_e = cross-sect. area (cm^2)

N = number of wire turns

F = frequency (Hertz)

The safety factor may be increased by using the peak AC voltage in the equation. This is a standard practice among many RF engineers who design broadband RF power transformers.

The above equation may be changed as shown below to make it more convenient during calculations of B_{max} at radio frequencies.

$$B_{max} = \frac{E \times 10^2}{4.44 \times A_e \times N \times F}$$

E_{pk} = applied RMS volts

A_e = cross-sect. area (cm^2)

N = number of wire turns

F = frequency (MHz)

The sample calculation below is based on a frequency of 7 MHz, a peak voltage of 25 volts and a primary winding of 15 turns. The cross-sectional area of the sample core is 0.133 cm^2. From previous guidelines we know that the maximum flux density at 7 MHz should be not more than 57 gauss.

$$B_{max} = \frac{25 \times 100}{4.44 \times 0.133 \times 15 \times 7} = 40.3 \text{ gauss}$$

This hypothetical toroid core will have a flux density of 40 gauss according to the above formula and when operated under the above conditions. This is well within the guidelines as suggested above.

Temperature rise can be the result of using an undersized wire gauge for the amount of current involved as well as magnetic action within the core. Both will contribute to the overall temperature rise of the transformer. This can be calculated with the following equation:

$$\text{Temperature Rise (°C)} = \left[\frac{\text{Total Power Dissipation (Milliwatts)}}{\text{Available Surface Area (cm}^2\text{)}}\right]^{.833}$$

If the operating temperature (ambient temperature + temperature rise) is more than 100°C when used intermittently, or more than 75°C if used continuously, a larger size core and/or a heavier gauge wire should be selected.

IRON POWDER CORE LOSS CHARACTERISTICS

The Iron Powder Q-curves section of this booklet can be very useful for designing high-Q, low power inductors and transformers, but additional consideration must be given to higher power applications.

Excessive temperature rise due to Iron Powder core loss at high frequencies will occur before saturation and is usually the primary limiting factor in the operation of an Iron Powder core inductor at high frequency.

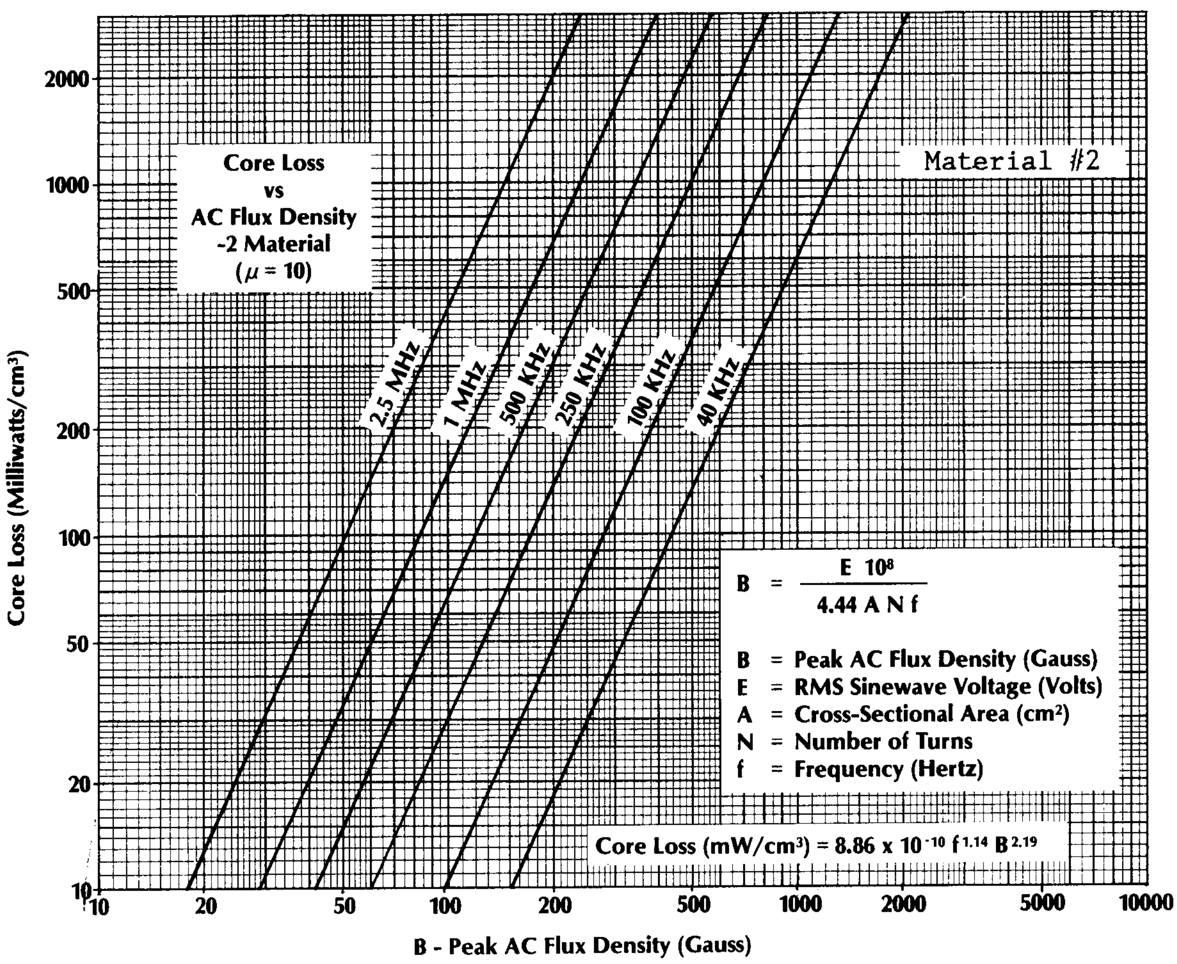
The following charts show core loss information in milliwatts per cubic centimeter of core material as a function of peak AC flux density for various frequencies. The Faraday Law is used to calculate the peak AC flux density. The effective cross-sectional area and volume for each core size can be found on previous pages of this booklet.

The following formula provides a reasonable approximation for the temperature rise of a core in free standing air.

$$\text{Temperature Rise (°C)} = \left[\frac{\text{Total Power Dissipation (Milliwatts)}}{\text{Available Surface Area (cm}^2\text{)}}\right]^{.833}$$

The surface area of a toroid increases at approximately a squared rate with the outside diameter, while the volume increases at approximately a cubed rate. The result is that a small diameter core can dissipate more power per unit volume than a larger diameter core for the same temperature rise.

Each of the three following graphs show core loss results in milliwatts per cubic centimeter as a function of frequency and AC flux density. These can be useful in projecting losses for frequencies not shown.



POWDER DISSIPATION vs. TEMPERATURE RISE

Power dissipation (mw/cc)as a function of temperature rise

Core Size	10 °C	25 °C	40 °C
T-30	400	1148	2026
T-37	412	1170	2065
T-44	310	884	1556
T-50	307	874	1535
T-68	234	664	1167
T-80	212	602	1056
T-94	160	454	802
T-106	114	322	566
T-130	117	331	582
T-157	94	266	468
T-200	87	260	436
T-300	62	186	327
T-400	43	130	228

Power rating for 25°C temperature rise due to core loss. No. 2 material, frequency 1 MHz.

Core Size	Watts
T-30	24
T-37	26
T-44	37
T-50	49
T-68	88
T-80	125
T-94	160
T-106	236
T-130	331
T-157	515
T-200	794
T-300	1127
T-400	2108

Additional information about power dissipation upon request

PROPERTY CHART - IRON POWDER

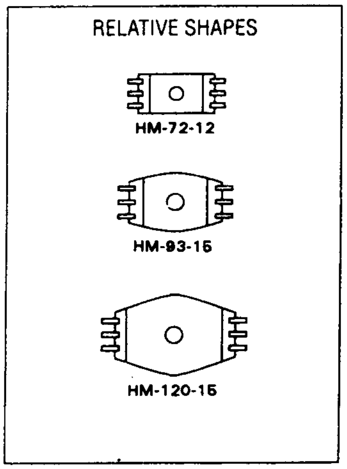
Iron Powder Material	Basic Iron Powder	Material Permeability μ_o	Temperature Stability (ppm/°C)	Resonant Circuit Frequency Range (MHz)	Color Code
0	Phenolic	1	0	100.0 - 300.0	Tan
1	Carbonyl C	20	280	0.5 - 5.0	Blue
2	Carbonyl E	10	95	2.0 - 30.0	Red
3	Carbonyl HP	35	370	0.05 - 0.5	Grey
6	Carbonyl SF	8	35	10.0 - 50.0	Yellow
7	Carbonyl TH	9	30	5.0 - 35.0	White
10	Carbonyl W	6	150	30.0 - 100.0	Black
12	Synthetic Oxide	4	170*	50.0 - 200.0	Green/White
15	Carbonyl GS6	25	190	0.10 - 2.0	Red/White
17	Carbonyl	4	50	50.00 - 200.0	Blue/Yellow
26	Special	75	882	LF filters, chokes	Yellow/White

* Non Linear
Material # 17 has been developed as a temperature stable alternative to the #12.
Frequency ranges shown are for best 'Q'. Useful over broader frequency range with lower 'Q'.

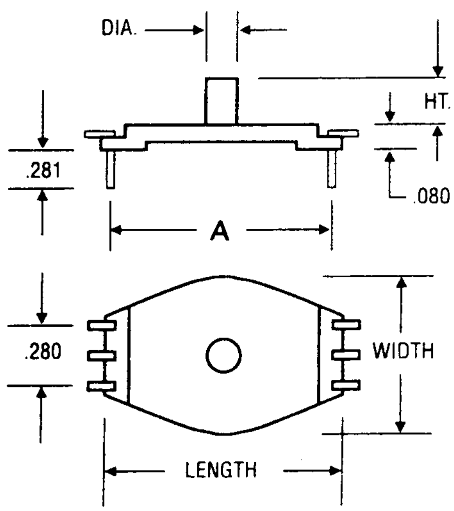
HORIZONTAL MOUNT FOR TOROID

The HM horizontal mounts for toroids are made of Nylon 6/6 material and rated at UL94-V0. It has 6 brass terminals. Each terminal is tin plated. These mounts are used for low profile horizontal mounting of wound toroids with outside diameter (OD) of 0.4" to 1.0".

Solderability: MIL-STD-202, Method 208
Terminals: 0.025" x 0.01", 60/40 tin plated



Not to scale
±.010 inches



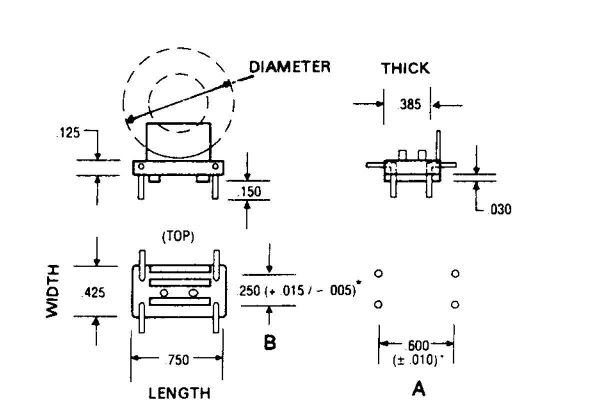
(All Dimensions are in inches)

Part No.	Length	Width	Ht.	Dia.	A	Toroidal Core Size
HM-72-12 HM-72-00	.720 .720	.460 .460	.163 .000	.120 .000	.638 .638	O.D. up to 0.5" FT-23, FT-50 T-25 → T-50
HM-93-00 HM-93-15	.937 .937	.600 .600	.000 .250	.000 .156	.848 .848	O.D. up to 0.825" FT-82, T-68, T-80
HM-120-00 HM-120-15	1.208 1.208	.850 .850	.000 .250	.000 .156	1.130 1.130	O.D. up to 1.0" FT-82, T-68, T-80

VERTICAL MOUNT FOR TOROIDS

The VM vertical mounts for toroids are made of Nylon 6/6 material and rated at UL94-V0. They are available either with no terminals or with 4, 10 or 14 terminals. Those with no terminals have four through holes of diameter 0.048" for mounting.

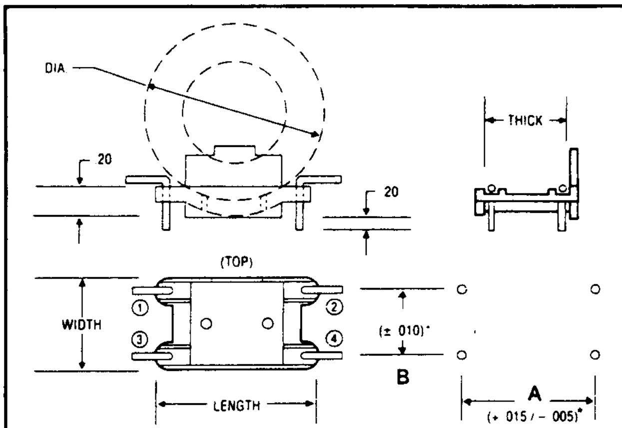
Solderability: MIL-STD-202, Method 208
Terminals: 0.04" diameter, 100% tin plated



(*Tolerance at end of terminal)

Not to scale
± .010 inches

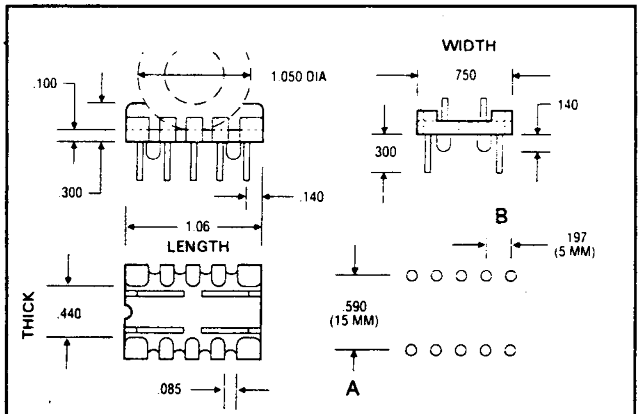
Figure 1



(*Tolerance at end of terminal)

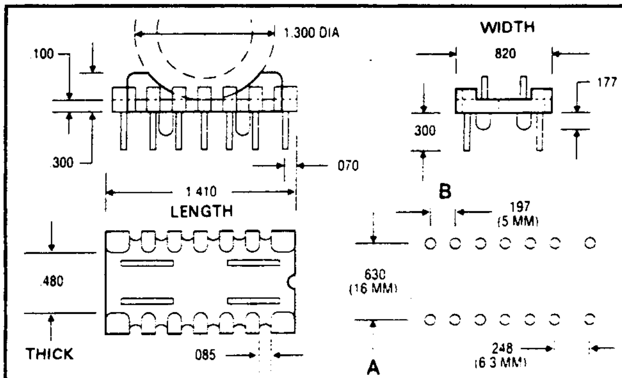
Not to scale
± .010 inches

Figure 2



Not to scale
± .010 inches

Figure 3



Not to scale
± .010 inches

Figure 4

(All Dimensions are in inches)

VERTICAL MOUNT FOR TOROIDS

Part No.	Figure	Length (inches)	Width (inches)	Thick (inches)	Toroid Diameter (inches)	A (inches)	B (inches)	Toroidal Core Size
VM-750-4	1	.75	.425	.385	1.00	.60	.250	4 terminals, 0.04", AWG #18, for toroid up to O.D.=1.15"
VM-750-0	1	.75	.425	.385	1.00	.60	.250	No terminal - 0.048" through hole for toroid up to O.D.=1.15"
VM-100-4	2	1.00	.60	.51	1.20	.80	.400	4 terminals, 0.050", AWG #16, for toroid up to O.D.=1.20"
VM-100-0	2	1.00	.60	.51	1.20	.80	.400	No terminal - 0.048" through hole for toroid up to O.D.=1.20"
VM-110-4	2	1.10	.80	.71	1.60	.90	.600	4 terminals, 0.05", AWG #16, for toroid up to O.D.=1.60"
VM-110-0	2	1.10	.80	.71	1.60	.90	.600	No terminal - 0.048" hole for toroid up to O.D.=1.60"
VM-140-4	2	1.40	.90	.81	2.54	1.20	.700	4 terminals, 0.050", AWG #16, for toroid up to O.D.=2.5"
VM-140-0	2	1.40	.90	.81	2.54	1.20	.700	No terminal - 0.048" hole for toroid up to O.D.=2.5"
VM-106-10	3	1.06	.75	.440	1.05	.59	.197	10 terminals, 0.04", AWG #18, for toroid up to O.D.=1.1"
VM-140-14	4	1.40	.82	.48	1.30	.63	.197	14 terminal - 0.04" AWG #18, for toroid up to O.D>=1.3"