SOLEN INC.

HEPTA-LITZ AIR CORED INDUCTORS
PERFECT LAY HEXAGONAL WINDING

SOLEN Inc. was the first inductor design company to introduce inductors made with **Hepta-Litz** conductors. Most of the time, until now, only one parameter was considered for designing crossover network inductors and that is dc winding resistance. The problem is that music is far from being dc and other non linear losses arise from ac frequency that can increase the ac winding resistance many times the dc value, even at audio frequency. Let us consider some of those losses.

As the frequency increase, additional power losses occur in the winding due to eddy currents in the conductors and by the magnetic fields within the winding. In the design of inductors both skin effect and proximity effect need to be considered. Both effects depend on the ratio of the conductors' diameter to the penetration depth of the electrons.

Skin Effect

Skin effect is the tendency for the alternating current to flow near the surface of the conductor as the frequency increase. It is due to eddy currents in the conductor that arise from the alternating magnetic field associated with the current in the conductor itself.

Proximity Effect

Proximity effect is the tendency for the alternating current to flow and return along the length of each conductor within the winding in a way that opposes the magnetic field of the winding as the frequency increase. It is due to the eddy currents in the conductor that arise from the alternating magnetic field interaction of the other conductors within the winding.

Litz Conductor

To reduce those losses, we have to replace the solid conductor with a number of separately insulated smaller conductors twisted together, the Litz conductor. The reduction of the conductors' diameter along with the increase in the number of twisted insulated conductors that tends to occupy all possible positions in the cross section of the resulting conductor are very effective in reducing both effects. The smaller insulated conductor makes the current to divide uniformly between them thus reducing the skin effect losses. The twist of the smaller insulated conductor cancels the EMF's induced by the traverse magnetic field thus reducing the proximity effect losses.

This design idea, Hepta-Litz that consists of seven twisted insulated conductors, results in equalizing the ac resistance to dc resistance ratios in the usable audio frequency band that is establishing new standards in inductor quality. The Hepta-Litz Air Cored Inductors Perfect Layer Hexagonal Winding are a clean slate design, based on proven state-of-the-art technology that we have successfully transferred and merged to achieve superiority on all fronts. They will dramatically improve the performance of any loudspeaker by linearizing the inductor reactance curve to the ideal inductor reactance.

L10 = 7 x .80 mm conductor's Ø = 2.4 mm conductor Ø = S12 = 2.0 mm conductor Ø dc resistance
L12 = 7 x .64 mm conductor's Ø = 2.0 mm conductor Ø = S14 = 1.6 mm conductor Ø dc resistance
L14 = 7 x .51 mm conductor's Ø = 1.6 mm conductor Ø = S16 = 1.3 mm conductor Ø dc resistance
L16 = 7 x .40 mm conductor's Ø = 1.3 mm conductor Ø = S18 = 1.0 mm conductor Ø dc resistance

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● GENERAL INFORMATION

Type	: Air Cored Inductor.
Conductors	: Pure Copper Seven Twisted Insulated Conductors.
Dielectric	: Red Polyurethane Polyamide Enamel.
Construction	: Hollow Cylindrical Type, Radial Leads.
Winding	: Perfect Layer Hexagonal Self-Supporting Type.
Coating	: Varnish Dip With Four Black Nylon Ties.
Leads	: Pure Copper.

● TECHNICAL DATA

Inductance Range/Tolerance	: 0.10 ... 30 mH, E 24 series, ±1 %. (see specifications for details)			
Conductor Material	: ≥ 99.99 % Purity Annealed Copper.			
Electrical Conductivity	: ≥ 101.5 %.			
DC Resistance	: Very Low (see specifications for details)			
Oxygen Content	: ≤ 200 ppm on surface.			
Temperature Coefficient	: 0.00393 / °C.			
Temperature Range	: -55 °C to +85 °C.			
Insulation Temperature	: 130 °C.			
Solderable Temperature	: 360 °C.			
Test Voltage	: 1000 VAC			
Total Conductor Diameter	: L16 = 1.3,	L14 = 1.6,	L12 = 2.0,	L10 = 2.4 mm Ø
Conductors Number/Diameter	: L16 = 7 x .40,	L14 = 7 x .51,	L12 = 7 x .64,	L10 = 7 x .80 mm Ø
Skin Effect Rac = Rdc	: L16 = 27,	L14 = 18,	L12 = 12,	L10 = 8 KHz
Skin Effect Rac = Rdc +10%	: L16 = 100,	L14 = 70,	L12 = 45,	L10 = 30 KHz
Winding Space Factor	: L16 = 86,	L14 = 87,	L12 = 88,	L10 = 89 %

● FEATURE

Integral Wheeler Formula Application.
Computer Optimized Inductor Dimension.
Ultra Linear AC Resistance
Linear Phase Angle between Current and Voltage.
Linear and Stable High Frequency Characteristics.
Very Low Magnetostriction Distortion.
Constant Inductance with Voltage Variation.
Constant Inductance with Current Variation.
No Saturation Distortion.
No Hyteresis Distortion.

● ELECTRICAL PERFORMANCE

Very High Quality Factor.
Very Low Skin Effect Losses.
Very Low Proximity Effect Losses.
Low A.C. Resistance.
Low D.C. resistance
Low Self Capacitance.

HEPTA-LITZ AIR CORED INDUCTORS
PERFECT LAY HEXAGONAL WINDING

AC/DC Resistance (Ohms) ±5%
Dimensions (mm) ±10%

L16 1.21 mm Ø (7 x .40 mm)
16 AWG (7 x 26 AWG)

P/N	Inductance	DCR	LxdxD
L16.10	.10 mH	.12	11x22x45
L16.11	.11 mH	.13	11x22x45
L16.12	.12 mH	.14	11x22x45
L16.13	.13 mH	.15	11x22x45
L16.15	.15 mH	.16	11x22x45
L16.16	.16 mH	.16	13x25x51
L16.18	.18 mH	.17	13x25x51
L16.20	.20 mH	.18	13x25x51
L16.22	.22 mH	.19	13x25x51
L16.24	.24 mH	.21	13x25x51
L16.27	.27 mH	.22	13x25x51
L16.30	.30 mH	.24	13x25x51
L16.33	.33 mH	.26	14x29x57
L16.36	.36 mH	.27	14x29x57
L16.39	.39 mH	.28	14x29x57
L16.43	.43 mH	.29	14x29x57
L16.47	.47 mH	.31	14x29x57
L16.51	.51 mH	.33	14x29x57
L16.56	.56 mH	.35	14x29x57
L16.62	.62 mH	.36	14x29x57
L16.68	.68 mH	.38	16x32x64
L16.75	.75 mH	.40	16x32x64
L16.82	.82 mH	.43	16x32x64
L16.91	.91 mH	.45	16x32x64
L161.0	1.0 mH	.47	16x32x64
L161.1	1.1 mH	.50	16x32x64
L161.2	1.2 mH	.54	16x32x64
L161.3	1.3 mH	.57	16x32x64
L161.5	1.5 mH	.60	16x32x64
L161.6	1.6 mH	.63	19x38x76
L161.8	1.8 mH	.68	19x38x76
L162.0	2.0 mH	.70	19x38x76
L162.2	2.2 mH	.76	19x38x76
L162.4	2.4 mH	.81	19x38x76
L162.7	2.7 mH	.87	19x38x76
L163.0	3.0 mH	.93	19x38x76
L163.3	3.3 mH	.98	22x45x89
L163.6	3.6 mH	1.03	22x45x89
L163.9	3.9 mH	1.09	22x45x89
L164.3	4.3 mH	1.15	22x45x89
L164.7	4.7 mH	1.22	22x45x89
L165.1	5.1 mH	1.29	22x45x89
L165.6	5.6 mH	1.36	22x45x89
L166.2	6.2 mH	1.43	22x45x89
L166.8	6.8 mH	1.51	25x51x102
L167.5	7.5 mH	1.59	25x51x102
L168.2	8.2 mH	1.67	25x51x102
L169.1	9.1 mH	1.75	25x51x102
L1610	10 mH	1.84	25x51x102
L1611	11 mH	1.98	25x51x102
L1612	12 mH	2.12	25x51x102

L14 1.53 mm Ø (7 x .51 mm)
14 AWG (7 x 24 AWG)

P/N	Inductance	DCR	LxdxD
L14.16	.16 mH	.11	14x29x57
L14.18	.18 mH	.11	14x29x57
L14.20	.20 mH	.12	14x29x57
L14.22	.22 mH	.13	14x29x57
L14.24	.24 mH	.14	14x29x57
L14.27	.27 mH	.15	14x29x57
L14.30	.30 mH	.16	14x29x57
L14.33	.33 mH	.16	16x32x64
L14.36	.36 mH	.17	16x32x64
L14.39	.39 mH	.18	16x32x64
L14.43	.43 mH	.19	16x32x64
L14.47	.47 mH	.21	16x32x64
L14.51	.51 mH	.22	16x32x64
L14.56	.56 mH	.23	16x32x64
L14.62	.62 mH	.24	16x32x64
L14.68	.68 mH	.25	19x38x76
L14.75	.75 mH	.27	19x38x76
L14.82	.82 mH	.28	19x38x76
L14.91	.91 mH	.30	19x38x76
L141.0	1.0 mH	.31	19x38x76
L141.1	1.1 mH	.33	19x38x76
L141.2	1.2 mH	.35	19x38x76
L141.3	1.3 mH	.38	19x38x76
L141.5	1.5 mH	.41	19x38x76
L141.6	1.6 mH	.44	22x45x89
L141.8	1.8 mH	.46	22x45x89
L142.0	2.0 mH	.48	22x45x89
L142.2	2.2 mH	.52	22x45x89
L142.4	2.4 mH	.56	22x45x89
L142.7	2.7 mH	.60	22x45x89
L143.0	3.0 mH	.63	22x45x89
L143.3	3.3 mH	.66	25x51x102
L143.6	3.6 mH	.70	25x51x102
L143.9	3.9 mH	.73	25x51x102
L144.3	4.3 mH	.77	25x51x102
L144.7	4.7 mH	.82	25x51x102
L145.1	5.1 mH	.86	25x51x102
L145.6	5.6 mH	.91	25x51x102
L146.2	6.2 mH	.96	32x64x127
L146.8	6.8 mH	1.01	32x64x127
L147.5	7.5 mH	1.07	32x64x127
L148.2	8.2 mH	1.12	32x64x127
L149.1	9.1 mH	1.18	32x64x127
L1410	10 mH	1.24	32x64x127
L1411	11 mH	1.38	32x64x127
L1412	12 mH	1.52	32x64x127

L12 1.93 mm Ø (7 x .64 mm)
12 AWG (7 x 22 AWG)

P/N	Inductance	DCR	LxdxD
L12.33	.33 mH	.10	19x38x76
L12.36	.36 mH	.11	19x38x76
L12.39	.39 mH	.12	19x38x76
L12.43	.43 mH	.12	19x38x76
L12.47	.47 mH	.13	19x38x76
L12.51	.51 mH	.14	19x38x76
L12.56	.56 mH	.15	19x38x76
L12.62	.62 mH	.16	19x38x76
L12.68	.68 mH	.17	22x45x89
L12.75	.75 mH	.18	22x45x89
L12.82	.82 mH	.19	22x45x89
L12.91	.91 mH	.20	22x45x89
L121.0	1.0 mH	.21	22x45x89
L121.1	1.1 mH	.23	22x45x89
L121.2	1.2 mH	.24	22x45x89
L121.3	1.3 mH	.26	22x45x89
L121.5	1.5 mH	.28	22x45x89
L121.6	1.6 mH	.29	25x51x102
L121.8	1.8 mH	.30	25x51x102
L122.0	2.0 mH	.31	25x51x102
L122.2	2.2 mH	.33	25x51x102
L122.4	2.4 mH	.36	25x51x102
L122.7	2.7 mH	.39	25x51x102
L123.0	3.0 mH	.42	25x51x102
L123.3	3.3 mH	.45	32x64x127
L123.6	3.6 mH	.47	32x64x127
L123.9	3.9 mH	.49	32x64x127
L124.3	4.3 mH	.52	32x64x127
L124.7	4.7 mH	.56	32x64x127
L125.1	5.1 mH	.59	32x64x127
L125.6	5.6 mH	.63	32x64x127
L126.2	6.2 mH	.67	32x64x127
L126.8	6.8 mH	.71	38x76x152
L127.5	7.5 mH	.75	38x76x152
L128.2	8.2 mH	.79	38x76x152
L129.1	9.1 mH	.83	38x76x152
L1210	10 mH	.87	38x76x152
L1211	11 mH	.96	38x76x152
L1212	12 mH	1.03	38x76x152

L10 2.40 mm Ø (7 x 0.80 mm)
10 AWG (7 x 20 AWG)

P/N	Inductance	DCR	LxdxD
L10.68	.68 mH	.11	25x51x102
L10.75	.75 mH	.12	25x51x102
L10.82	.82 mH	.12	25x51x102
L10.91	.91 mH	.13	25x51x102
L101.0	1.0 mH	.14	25x51x102
L101.1	1.1 mH	.15	25x51x102
L101.2	1.2 mH	.16	25x51x102
L101.3	1.3 mH	.17	25x51x102
L101.5	1.5 mH	.19	25x51x102
L101.6	1.6 mH	.20	32x64x127
L101.8	1.8 mH	.21	32x64x127
L102.0	2.0 mH	.22	32x64x127
L102.2	2.2 mH	.24	32x64x127
L102.4	2.4 mH	.26	32x64x127
L102.7	2.7 mH	.28	32x64x127
L103.0	3.0 mH	.30	32x64x127
L103.3	3.3 mH	.32	38x76x152
L103.6	3.6 mH	.34	38x76x152
L103.9	3.9 mH	.35	38x76x152
L104.3	4.3 mH	.37	38x76x152
L104.7	4.7 mH	.40	38x76x152
L105.1	5.1 mH	.42	38x76x152
L105.6	5.6 mH	.45	38x76x152
L106.2	6.2 mH	.47	38x76x152
L106.8	6.8 mH	.49	45x89x178
L107.5	7.5 mH	.52	45x89x178
L108.2	8.2 mH	.54	45x89x178
L109.1	9.1 mH	.57	45x89x178
L1010	10 mH	.60	45x89x178
L1011	11 mH	.65	45x89x178
L1012	12 mH	.70	45x89x178

L1613	13	mH 2.27	25x51x102	L1413	13	mH 1.66	32x64x127	L1213	13	mH 1.11	38x76x152	L1013	13	mH .75	45x89x178
L1615	15	mH 2.42	25x51x102	L1415	15	mH 1.70	32x64x127	L1215	15	mH 1.17	38x76x152	L1015	15	mH .79	45x89x178
				L1416	16	mH 1.79	38x76x152	L1216	16	mH 1.24	45x89x178	L1016	16	mH .83	51x102x204
				L1418	18	mH 1.88	38x76x152	L1218	18	mH 1.29	45x89x178	L1018	18	mH .88	51x102x204
				L1420	20	mH 1.97	38x76x152	L1220	20	mH 1.35	45x89x178	L1020	20	mH .92	51x102x204
				L1422	22	mH 2.07	38x76x152	L1222	22	mH 1.44	45x89x178	L1022	22	mH .99	51x102x204
				L1424	24	mH 2.17	38x76x152	L1224	24	mH 1.53	45x89x178	L1024	24	mH 1.06	51x102x204
				L1427	27	mH 2.27	38x76x152	L1227	27	mH 1.62	45x89x178	L1027	27	mH 1.13	51x102x204
				L1430	30	mH 2.37	38x76x152	L1230	30	mH 1.71	45x89x178	L1030	30	mH 1.20	51x102x204

Maximum recommended dc resistance for series inductors for 8 ohms load: 0.6 Ohms total.
Maximum recommended dc resistance for parallel inductors for 8 ohms load: 1.2 Ohms.