Litz & Winding Wires

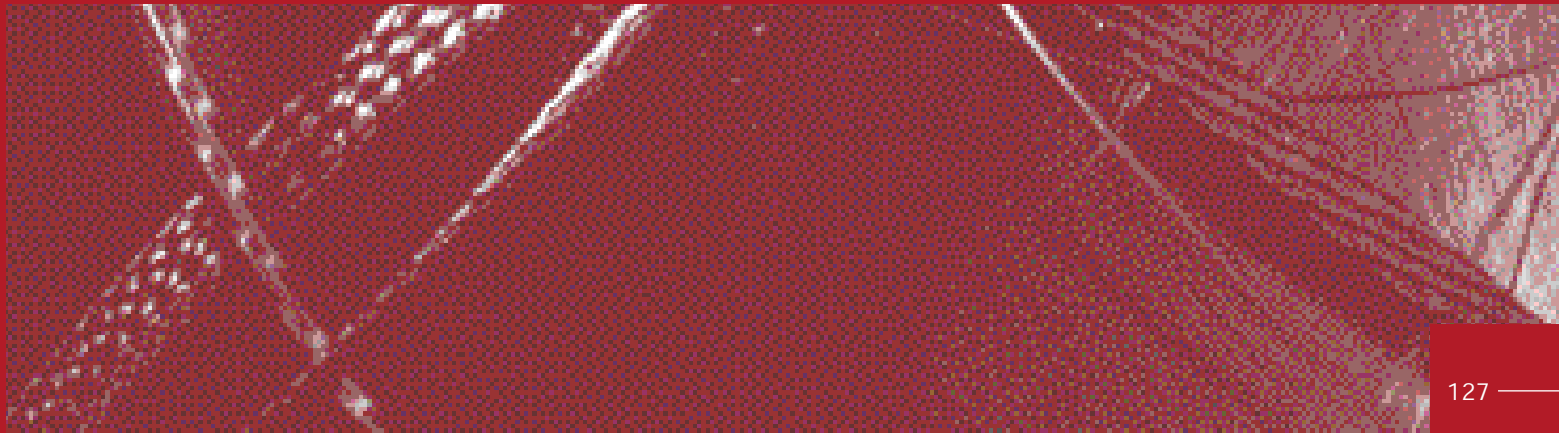
The term "Litz," derived from the German word "Litzendraht" describes a conductor consis insulated strands twisted or braided together. This design equalizes the flux linkages and the individual strands causing the current to spread uniformly throughout the conductor. The resistance ratio (A.C. to D.C.) then tends to approach unity, which is desirable in all high-Q circuit applications.

In 1898, New England Wire became the first company in the United States to manufacture Litz wire on a commercial basis. Since then we have designed and manufactured thousands of constructions for use in high frequency inductors and transformers, inverters, communication equipment, ultrasonic equipment, sonar equipment, television equipment, radio equipment and induction heating equipment. We have also provided cabling, insulating and other services to the superconductor industry since its inception in the early 1960s. And our products are integrated into major accelerator projects, ore separator magnets, NMR magnets, and superconducting magnetic energy storage magnets.

WINDING WIRES

New England Wire Technologies also manufactures specialty winding wires that reduce the size of your designs and save you time and money.

NEWind® Specialty Winding Wire solves the problem of insulating between winding turns by coating the conductors with thin layers of fluoropolymer insulation.



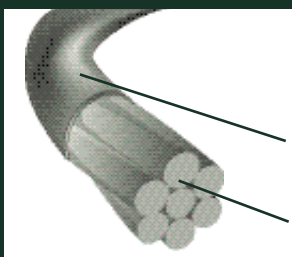
LITZ & WINDING WIRES

New England Wire Technologies is a pioneer and leading designer and manufacturer of Litz wire and specialty winding wire. Litz wire conductors are beneficial for reducing A.C. losses in high frequency windings. New England Wire offers many Litz wire constructions with multiple layers of insulation to meet voltage withstand requirements of UL and IEC.

Our NE-F1 Class F (155° C) Electrical Insulation Systems featuring NEWind® Specialty Winding Wires meets UL 1446 Electrical Insulation System. These high performance products eliminate the need for long term component testing and allow the development of unique solutions to your most complex design challenges, making them ideal for transformer, motor and coil applications.

LITZ WIRE TYPES & CONSTRUCTION

Round Type 1

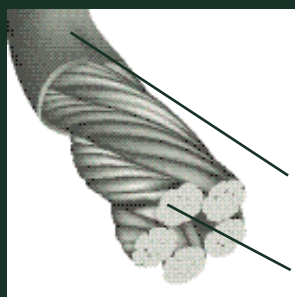


Type 1 Litz construction features a single twisting operation with optional outer insulation.

Outer insulation of textile yarn, tape or extruded compounds.

Single film-insulated wire strand.

Round Type 2



Type 2 Litz construction features bundles of twisted wire twisted together with optional outer insulation.

Outer insulation of textile yarn, tape or extruded compounds.

Bundles of Type 1 Litz wire.

Round Type 3

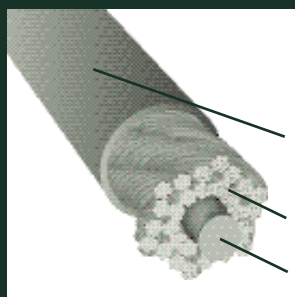
Type 3 Litz construction features insulated bundles of twisted wire twisted together with optional outer insulation.

Outer insulation of textile yarn, tape or extruded compounds.

Individually insulated bundles.

Bundles of Type 2 Litz wire.

Round Type 4



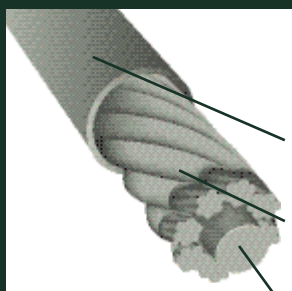
Type 4 Litz construction features bundles of twisted wire twisted together around a central fiber core.

Outer insulation of textile yarn, tape or extruded compounds.

Bundles of Type 2 Litz wire.

Fiber core.

Round Type 5



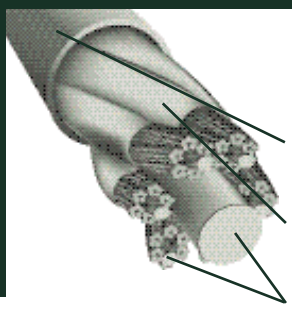
Type 5 Litz construction features insulated bundles of Type 2 Litz wire twisted around a fiber core.

Optional outer insulation of textile yarn, tape or extruded compounds.

Individually insulated bundles of Type 2 Litz wire.

Fiber core.

Round Type 6



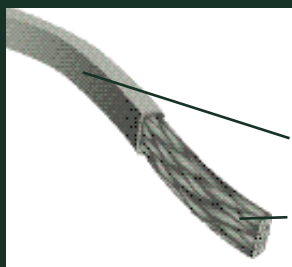
Type 6 Litz construction features insulated bundles of Type 4 Litz wire twisted around a fiber core.

Optional outer insulation of textile yarn, tape or extruded compounds.

Bundles of Type 4 Litz wire insulated with nylon serving.

Fiber cores.

Rectangular Type 7

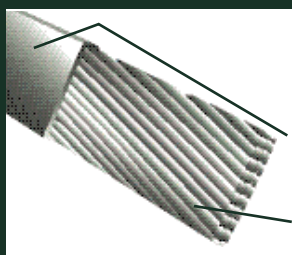


Type 7 Litz construction features insulated wire braided and formed into rectangular profile.

Optional outer insulation of textile yarn, tape or extruded compounds.

Braided film-insulated wire.

Rectangular Type 8



Type 8 Litz construction features insulated strands twisted and compressed into rectangular profile.

Optional outer insulation of textile yarn, tape or extruded compounds.

Compacted film-insulated wires or compacted groups.

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Litz Wire

For optimum performance, the Litz constructions covered in this section are made with individually insulated strands. Common magnet wire film insulations such as: polyvinylformal, polyurethane, polyurethane/nylon; solderable polyester, solderable polyester/nylon, polyester/polyamide-imide, and polyimide are normally used. The outer insulation and the insulation on the component conductors, in some styles, may be servings or braids of nylon, cotton, Nomex[1], fiberglass or ceramic. Polyester, heat sealed polyester, polyimide and PTFE tape wraps along with extrusions of most thermoplastics are also available as outer insulation if the applications dictate special requirements for voltage breakdown or environmental protection.

Litz Design

Typically, the design engineer requiring the use of Litz knows the operating frequency and RMS current required for the application. Since the primary benefit of a Litz conductor is the reduction of A.C. losses, the first consideration in any Litz design is the operating frequency. The operating frequency not only influences the actual Litz construction, but is also used to determine the individual wire gauge.

Ratios of alternating-current resistance to direct-current resistance for an isolated solid round wire (H) in terms of a value (X) are shown in Table 1.

Table 1

X	0	0.5	0.6	0.7	0.8	0.9	1.0
H	1.0000	1.0003	1.0007	1.0012	1.0021	1.0034	1.005

The value of X for copper wire is determined by Formula 1.

FORMULA 1

$$X = 0.271\, D_M \sqrt{F_{MHZ}}$$

Where: D_M = Wire diameter in mils
F_{MHZ} = Frequency in Megahertz

From Table 1 and other empirical data the following table of recommended wire gauges vs. frequency for most Litz constructions has been prepared.

Table 2

FREQUENCY	RECM'D WIRE GAUGE	NOM. DIA. OVER COPPER	DC RES. OHMS/M' (MAX)	SINGLE STRAND R_{AC}/R_{DC} "H"
60 HZ to 1 KHZ	28 AWG	.0126	66.37	1.0000
1 KHZ to 10 KHZ	30 AWG	.0100	105.82	1.0000
10 KHZ to 20 KHZ	33 AWG	.0071	211.70	1.0000
20 KHZ to 50 KHZ	36 AWG	.0050	431.90	1.0000
50 KHZ to 100 KHZ	38 AWG	.0040	681.90	1.0000
100 KHZ to 200 KHZ	40 AWG	.0031	1152.3	1.0000
200 KHZ to 350 KHZ	42 AWG	.0025	1801.0	1.0000
350KHZ to 850 KHZ	44 AWG	.0020	2873.0	1.0003
850 KHZ to 1.4 MHZ	46 AWG	.0016	4544.0	1.0003
1.4MHZ to 2.8 MHZ	48 AWG	.0012	7285.0	1.0003

After the individual wire gauge has been determined and assuming that the Litz construction has been designed such that each strand tends to occupy all possible positions in the cable to approximately the same extent, the ratio of A.C. to D.C. resistance of an isolated Litz conductor can be determined from the following formula.

FORMULA 2[2]

$$\frac{\text{Resistance to Alternating Current}}{\text{Resistance to Direct Current}} = H + K\left(\frac{N\,D_l}{D_o}\right)^2 G$$

[1] DuPont Registered Trademark

[2] See Radio Engineers Handbook - Terman, pp. 30-83.

Where: H = Resistance ratio of individual strands when isolated (taken from Table 1 or 2)

G = Eddy-current basis factor $= \left(\frac{D_I\sqrt{F}}{10.44}\right)^4$

F = Operating frequency in HZ

N = Number of strands in the cable

D_I = Diameter of the individual strands over the copper in inches

D_O = Diameter of the finished cable over the strands in inches

K = Constant depending on N, given in the following table

N	3	9	27	Infinity
K	1.55	1.84	1.92	2

The D.C. resistance of a Litz conductor is related to the following parameters:

1. AWG of the individual strands.
2. Number of strands in the cable.
3. Factors relating to the increased length of the individual strands per unit length of cable (take-up). For normal Litz constructions a 1.5% increase in D.C. resistance for every bunching operation and a 2.5% increase in D.C. resistance for every cabling operation are approximately correct.

The formula derived from these parameters for the D.C. resistance of any Litz construction is:

FORMULA 3

$$R_{DC} = \frac{R_S(1.02)^{N_B}\ (1.03)^{N_C}}{N_S}$$

Where: R_{DC} = Resistance in Ohms/1000 ft.

R_S = Maximum D.C. resistance of the individual strands (taken from Table 2)

N_B = Number of bunching operations

N_C = Number of cabling operations

N_S = Number of individual strands

Following is an example of the calculations required to evaluate a Type 2 Litz construction consisting of 450 strands of 40 AWG single-film polyurethane-coated wire operating at 100 KHZ. This construction, designed with two bunching operations and one cabling operation, would be written 5x3/30/40 (NEW uses “x” to indicate a cabling operation and “/” to indicate a bunching operation.)

1. Calculate the D.C. resistance of the Litz construction using formula 3.

$$R_{DC} = \frac{1152.3x(1.015)^2 x(1.025)^1}{450} = 2.70 \text{ ohms/1000'}$$

2. Calculate the A.C. to D.C. resistance ratio using formula 2.

$$\frac{R_{AC}}{R_{DC}} = 1.0000 + 2\left(\frac{450 \times 0.0031}{0.094}\right)^2 (7.8x10^{-6}) = 1.0344$$

3. The A.C. resistance is, therefore, 1.0344 x 2.70 or 2.79 ohms/1000 ft.

The value of Litz can easily be seen if the above example is compared with a solid round wire with equivalent cross sectional area, 65.8 mils in diameter. Using the same operating parameters, the D.C. resistance is 2.395 ohms/1000 ft. However, the A.C./D.C. resistance ratio increases to approximately 21.4 making the A.C. resistance 51.3 ohms/1000 ft.

The following tables list examples of Litz constructions which can be manufactured by New England Wire Technologies. These are categorized by operating frequency and by equivalent AWG size. Round, braided and rectangular Litz conductors are shown separately to provide the greatest possible selection for any design application.

Round Litz

Litz constructions Types 1 through 6 are all designed to be round and vary from a simple bunch of conductors (Type 1) to complex designs utilizing multiple cores and several manufacturing operations (Type 6).

The smaller constructions of Litz Types 1 and 2 are typically used in High Q circuitry, such as toroidal coils and transformers. The larger Type 2 and 3 Litz designs have greater current carrying capacities necessary for high frequency power supply, inverter and grounding applications. Type 4, 5 and 6 Litz constructions all utilize at least one inert core and are used primarily in tuning circuitry for high power radio transmitters.

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Construction Type	Outer Insulation[2]	Nominal OD	Nominal LBS./1000 FT.	Direct Current Resistance OHM/1000 FT^	Construction
RECOMMENDED OPERATING FREQUENCY - 60 HZ TO 1 KHZ										
24	476	3	28	S	1	-	.027	1.49	22.570	3/28
22	794	5	28	S	1	-	.035	2.49	13.540	5/28
20	1112	7	28	S	1	-	.042	3.49	9.670	7/28
18	1588	10	28	S	1	-	.050	4.99	6.770	10/28
16	2700	17	28	S	1	SN	.065	8.68	3.980	17/28
14	4129	26	28	S	1	SN	.080	13.23	2.600	26/28
12	6670	42	28	S	1	SN	.102	21.28	1.610	42/28
10	10480	66	28	S	2	SN	.140	34.02	1.060	3X22/28
8	16674	105	28	S	2	SN	.177	54.01	.660	3X35/28
6	26202	165	28	S	2	SN	.222	86.59	.420	5X33/28
4	42240	266	28	S	2	DN	.285	141.87	.260	7X38/28
2	66696	420	28	S	2	DN	.431	227.39	.170	5X3X28/28
1/0	105602	665	28	S	2	SNB	.537	366.00	.110	7X5X19/28
2/0	133392	840	28	S	5	SNB	.657	480.00	.084	6(5X28/28)
3/0	171504	1080	28	S	5	SNB	.787	634.00	.065	9(5X24/28)
4/0	217238	1368	28	S	5	SNB	.941	828.00	.051	12(3X38/28)
RECOMMENDED OPERATING FREQUENCY - 1 HZ TO 10 KHZ										
26	300	3	30	S	1	-	.022	.95	35.980	3/30
24	500	5	30	S	1	-	.028	1.58	21.590	5/30
22	700	7	30	S	1	-	.033	2.21	15.420	7/30
20	1100	11	30	S	1	-	.045	3.47	9.810	11/30
18	1700	17	30	S	1	SN	.055	5.52	6.350	17/30
16	2600	26	30	S	1	SN	.064	8.38	4.150	26/30
14	4200	42	30	S	1	SN	.082	13.48	2.570	42/30
12	6500	65	30	S	2	SN	.112	21.21	1.710	5X13/30
10	11000	110	30	S	2	SN	.145	35.75	1.010	5X22/30
8	16800	168	30	H	2	-	.191	55.03	.660	7X24/30
7	25900	259	30	H	2	-	.237	84.83	.430	7X37/30
6	26600	266	30	H	2	-	.240	87.13	.420	7X38/30
4	41300	413	30	H	2	-	.300	138.27	.270	7X59/30
3	52500	525	30	H	2	-	.338	171.96	.210	7X75/30
2	66500	665	30	H	2	-	.380	217.81	.170	7X95/30
2	80500	805	30	H	2	DN	.421	272.95	.140	7X115/30
1/0	125000	1250	30	S	2	SNB	.631	435.00	.090	5X5X50/30
2/0	135000	1350	30	S	5	SNB	.667	486.00	.083	6(5X45/30)
3/0	195000	1950	30	S	5	SNB	.794	697.00	.057	6(5X5X13/30)
4/0	252000	2520	30	S	5	SNB	.981	916.00	.045	6(5X3X28/30)

1 S = single-film coating thickness
H = heavy-film coating thickness

2 SN = single nylon serving
DN = double nylon serving
SNB = single nylon braid
PVC = extruded polyvinylchloride

^ Not for specification purposes.

All measurements are in inches unless otherwise stated.

Round Litz, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Construction Type	Outer Insulation[2]	Nominal OD	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT^	Construction
RECOMMENDED OPERATING FREQUENCY - 10 KHZ TO 20 KHZ										
26	303	6	33	S	1	SN	.025	1.00	35.990	6/33
24	403	8	33	S	1	-	.025	1.27	26.990	8/33
22	655	13	33	S	1	SN	.035	2.13	16.610	13/33
20	1059	21	33	S	1	SN	.044	3.41	10.280	21/33
18	1613	32	33	S	1	SN	.054	5.24	6.750	32/33
16	2672	53	33	S	1	SN	.066	8.59	4.070	53/33
14	5041	100	33	S	2	SN	.099	16.44	2.220	5X20/33
12	7562	150	33	S	2	SN	.121	24.60	1.480	5X30/33
10	10586	210	33	S	2	SN	.143	34.36	1.060	3X70/33
8	16585	329	33	S	2	DN	.175	55.20	.680	7X47/33
6	26465	525	33	S	2	DN	.237	92.03	.440	5X3X35/33
4	42849	850	33	S	2	DN	.302	147.14	.270	5X5X34/33
2	66541	1320	33	S	5	SNB	.484	244.00	.171	6(5X44/33)
1	90738	1800	33	S	5	SNB	.558	334.00	.127	6(3/5/20/33)
1/0	105861	2100	33	S	5	SNB	.600	383.00	.107	6(5/70/33)
2/0	136107	2700	33	S	5	SNB	.675	496.00	.084	6(5X3/30/33)
3/0	169377	3360	33	S	5	SNB	.850	651.00	.067	12(5X56/33)
4/0	211772	4200	33	S	5	SNB	.987	841.00	.054	14(5X3/20/33)
-	299435	5940	33	S	6	PVC	1.290	1255.00	.038	6(6(5/33/33))
-	512972	10176	33	S	6	PVC	1.800	2283.00	.022	8(6(4X53/33))
-	725904	14400	33	S	6	PVC	2.420	3550.00	.016	15(6(5X32/33))
-	917462	18200	33	S	6	PVC	3.120	5088.00	.012	20(13(70/33))
-	1572792	31200	33	S	6	PVC	3.990	8684.00	.007	20(6(5/52/33))
RECOMMENDED OPERATING FREQUENCY - 20 KHZ TO 50 KHZ										
30	100	4	36	S	1	-	.013	.318	110.100	4/36
28	175	7	36	S	1	-	.017	.557	62.900	7/36
26	250	10	36	S	1	SN	.023	.839	44.050	10/36
24	400	16	36	S	1	SN	.029	1.340	27.530	16/36
22	675	27	36	S	1	SN	.037	2.220	16.320	27/36
20	1025	41	36	S	1	SN	.044	3.350	10.740	41/36
18	1625	65	36	S	2	SN	.059	5.440	6.980	5X13/36
16	2625	105	36	S	2	SN	.074	8.740	4.320	3X35/36
14	4125	165	36	S	2	SN	.092	13.660	2.750	5X33/36
12	6625	265	36	S	2	SN	.116	21.830	1.710	5X53/36
10	10500	420	36	S	2	DN	.158	35.630	1.110	5X3X28/36
8	16500	660	36	S	2	DN	.197	59.010	.710	5X3X44/36
6	26250	1050	36	S	2	DN	.247	92.450	.450	5X5X42/36
4	45000	1800	36	S	2	DN	.322	156.420	.260	5X5X72/36
2	66500	2660	36	S	2	DN	.373	228.670	.180	7X5X76/36
1	84000	3360	36	S	5	SNB	.548	318.000	.140	6(5X4X28/36)
1/0	108000	4320	36	S	5	SNB	.655	420.000	.109	9(5X3X32/36)
2/0	135000	5400	36	S	5	SNB	.728	522.000	.087	9(5X3X40/36)
3/0	171000	6840	36	S	5	SNB	.870	682.000	.069	12(5X3X38/36)
4/0	211500	8460	36	S	5	SNB	.962	840.000	.055	12(5X3X47/36)

1 S = single-film coating thickness
H = heavy-film coating thickness

2 SN = single nylon serving
DN = double nylon serving
SNB = single nylon braid
PVC = extruded polyvinylchloride

^ Not for specification purposes.

All measurements are in inches unless otherwise stated.

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Round Litz, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Construction Type	Outer Insulation[2]	Nominal OD	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT^	Construction
RECOMMENDED OPERATING FREQUENCY - 50 KHZ TO 100 KHZ										
30	112	7	38	S	1	SN	.017	.380	99.360	7/38
28	160	10	38	S	1	SN	.019	.542	69.550	10/38
26	256	16	38	S	1	SN	.024	.850	43.470	16/38
24	400	25	38	S	1	SN	.029	1.320	27.820	25/38
22	640	40	38	S	1	SN	.036	2.060	17.390	40/38
20	1056	66	38	S	1	SN	.045	3.380	10.750	3/22/38
18	1600	100	38	S	2	SN	.059	5.250	7.160	5X20/38
16	2592	162	38	S	2	SN	.069	8.270	4.380	3/54/38
14	4160	260	38	S	2	SN	.093	13.470	2.760	5X52/38
12	6720	420	38	S	2	SN	.117	21.690	1.740	5X3/28/38
10	10560	660	38	S	2	DN	.149	33.980	1.110	5X3/44/38
8	16800	1050	38	S	2	DN	.200	58.940	.700	5X5X42/38
6	26400	1650	38	S	2	DN	.249	91.200	.450	5X5X66/38
4	42000	2625	38	S	2	DN	.320	143.450	.290	5X5X3/35/38
2	66240	4140	38	S	5	SNB	.494	247.000	.180	6(5X3/46/38)
1	84000	5250	38	S	5	SNB	.551	311.000	.141	6(5X5X35/38)
1/0	105600	6600	38	S	5	SNB	.613	389.000	.112	6(5X5X44/38)
2/0	136000	8500	38	S	5	SNB	.749	522.000	.087	10(5X5X34/38)
3/0	168000	10500	38	S	5	SNB	.828	642.000	.070	10(5X5X42/38)
4/0	211200	13200	38	S	5	SNB	.966	824.000	.056	12(5X5X44/38)
RECOMMENDED OPERATING FREQUENCY - 100 KHZ TO 200 KHZ										
34	38.4	4	40	S	1	-	.008	.127	293.840	4/40
32	67.3	7	40	S	1	-	.011	.221	167.910	7/40
30	106.0	11	40	S	1	SN	.016	.379	106.850	11/40
28	163.0	17	40	S	1	SN	.020	.580	69.140	17/40
26	260.0	27	40	S	1	SN	.024	.897	43.530	27/40
24	404.0	42	40	S	1	SN	.029	1.397	27.980	42/40
22	634.0	66	40	S	2	SN	.038	2.197	18.340	3X22/40
20	1036.0	108	40	S	2	SN	.045	3.492	11.100	3/36/40
18	1634.0	170	40	S	2	SN	.056	5.537	7.050	5/34/40
16	2595.0	270	40	S	2	SN	.069	8.809	4.530	3/3/30/40
14	4180.0	435	40	S	2	SN	.093	14.264	2.840	5X3/29/40
12	6727.0	700	40	S	2	SN	.126	23.371	1.780	5X5X28/40
10	10571.0	1100	40	S	2	SN	.157	36.608	1.130	5X5X44/40
8	17298.0	1800	40	S	5	DN	.236	66.600	.700	6(5X3/20/40)
6	26812.0	2790	40	S	5	DN	.293	103.000	.451	6(5X3/31/40)
4	42813.0	4455	40	S	5	SNB	.431	176.000	.282	9(5X3/33/40)
2	69192.0	7200	40	S	5	SNB	.572	290.000	.174	12(5X3/40/40)
1/0	105710.0	11000	40	S	5	SNB	.668	428.000	.114	10(5X5X44/40)

1 S = single-film coating thickness
H = heavy-film coating thickness

2 SN = single nylon serving
DN = double nylon serving
SNB = single nylon braid
PVC = extruded polyvinylchloride

^ Not for specification purposes.

All measurements are in inches unless otherwise stated.

Round Litz, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Construction Type	Outer Insulation[2]	Nominal OD	Nominal LBS/1000 FT.	Direct Current Resistance OHMS/1000 FT^	Construction
RECOMMENDED OPERATING FREQUENCY - 200 KHZ TO 350 KHZ										
36	25	4	42	S	1	-	.006	.079	459.260	4/42
34	44	7	42	S	1	SN	.012	.169	262.430	7/42
32	63	10	42	S	1	SN	.013	.228	183.700	10/42
30	100	16	42	S	1	SN	.016	.346	114.810	16/42
28	163	26	42	S	1	SN	.019	.542	70.650	26/42
26	250	40	42	S	1	SN	.023	.829	45.930	40/42
24	413	66	42	S	2	SN	.029	1.370	28.390	3/22/42
22	656	105	42	S	2	SN	.036	2.130	17.850	5/21/42
20	1031	165	42	S	2	SN	.045	3.330	11.360	5/33/42
18	1688	270	42	S	2	SN	.060	5.580	7.150	5X3/18/42
16	2625	420	42	S	2	SN	.074	8.630	4.600	5X3/28/42
14	4125	660	42	S	2	SN	.092	13.490	2.920	5X3/44/42
12	6563	1050	42	S	2	DN	.127	21.820	1.860	5X5X42/42
10	10687	1710	42	S	5	DN	.185	40.300	1.150	6(5X3/19/42)
8	16875	2700	42	S	5	DN	.231	63.000	.729	6(5X3/30/42)
6	26250	4200	42	S	5	DN	.287	97.100	.468	6(5X5/28/42)
4	42188	6750	42	S	5	SNB	.434	169.000	.291	10(5X3/45/42)
2	67500	10800	42	S	5	SNB	.561	272.000	.182	12(5X5/36/42)
RECOMMENDED OPERATING FREQUENCY - 350 KHZ TO 850 KHZ										
38	16	4	44	S	1	-	.005	.050	732.620	4/44
36	28	7	44	S	1	SN	.010	.118	418.640	7/44
34	40	10	44	S	1	SN	.011	.156	293.050	10/44
32	64	16	44	S	1	SN	.013	.230	183.150	16/44
30	100	25	44	S	1	SN	.016	.342	117.220	25/44
28	160	40	44	S	1	SN	.019	.529	73.260	40/44
26	264	66	44	S	2	SN	.024	.874	45.290	3/22/44
24	420	105	44	S	2	SN	.029	1.380	28.470	3/35/44
22	640	160	44	S	2	SN	.035	2.060	18.680	5/32/44
20	1020	255	44	S	2	SN	.044	3.250	11.720	5/51/44
18	1620	405	44	S	2	SN	.058	5.310	7.600	5X3/27/44
16	2600	650	44	S	2	SN	.072	8.470	4.740	5X5/26/44
14	4200	1050	44	S	2	SN	.094	13.870	2.960	5X5X42/44
12	6600	1650	44	S	2	DN	.120	22.010	1.920	5X5X3/22/44
10	10500	2625	44	S	2	DN	.149	34.810	1.210	5X5X3/35/44
8	16800	4200	44	S	5	DN	.226	62.000	.747	6(5X5/28/44)

1 S = single-film coating thickness
H = heavy-film coating thickness

2 SN = single nylon serving
DN = double nylon serving
SNB = single nylon braid
PVC = extruded polyvinylchloride

^ Not for specification purposes.

All measurements are in inches unless otherwise stated.

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Round Litz, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Construction Type	Outer Insulation[2]	Nominal OD	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT^	Construction
RECOMMENDED OPERATING FREQUENCY - 850 KHZ TO 1.4 MHZ										
38	17.3	7	46	S	1	-	.005	.054	662.13	7/46
36	24.7	10	46	S	1	SN	.009	.108	463.49	10/46
34	39.5	16	46	S	1	SN	.011	.155	289.68	16/46
32	64.2	26	46	S	1	SN	.013	.232	178.26	26/46
30	101.0	41	46	S	1	SN	.016	.349	113.05	41/46
28	163.0	66	46	S	2	SN	.019	.554	71.63	3/22/46
26	259.0	105	46	S	2	SN	.023	.865	45.02	3/35/46
24	408.0	165	46	S	2	SN	.029	1.350	28.65	5/33/46
22	667.0	270	46	S	2	SN	.038	2.200	18.03	3X3/30/46
20	1038.0	420	46	S	2	SN	.047	3.400	11.59	5X3/28/46
18	1630.0	660	46	S	2	SN	.058	5.380	7.38	5X3/44/46
16	2593.0	1050	46	S	2	SN	.072	8.480	4.64	5X5/42/46
14	4261.0	1725	46	S	2	DN	.094	14.440	2.91	5X5X3/23/46
12	6669.0	2700	46	S	2	DN	.120	22.400	1.86	5X5X3/36/46
10	10745.0	4350	46	S	5	DN	.191	40.500	1.14	6(5X5/29/46)
RECOMMENDED OPERATING FREQUENCY - 1.4 MHZ TO 2.8 MHZ										
42	7.7	5	48	S	1	-	.004	.246	1486.14	5/48
40	10.8	7	48	S	1	SN	.007	.034	1061.53	7/48
38	18.5	12	48	S	1	SN	.009	.090	619.23	12/48
36	27.7	18	48	S	1	SN	.010	.120	412.82	18/48
34	40.0	26	48	S	1	SN	.011	.159	285.80	26/48
32	69.3	45	48	S	1	SN	.014	.252	165.13	45/48
30	102.0	66	48	S	2	SN	.016	.356	114.84	3/22/48
28	162.0	105	48	S	2	SN	.020	.560	71.18	5/21/48
26	277.0	180	48	S	2	SN	.026	.955	42.52	5X36/48
24	462.0	300	48	S	2	SN	.031	1.560	25.77	5/3/20/48
22	647.0	420	48	S	2	SN	.036	2.160	18.41	5/3/28/48
20	1040.0	675	48	S	2	SN	.048	3.470	11.57	5X3/45/48
18	1694.0	1100	48	S	2	SN	060	5.680	7.10	5X5/44/48
16	2657.0	1725	48	S	2	SN	.074	9.350	4.62	5X5/3/23/48
14	4158.0	2700	48	S	2	SN	.093	14.600	2.95	5X5/3/36/48
12	6930.0	4500	48	S	5	DN	.159	26.900	1.77	6(5X5/30/48)

1 S = single-film coating thickness
H = heavy-film coating thickness

2 SN = single nylon serving
DN = double nylon serving
SNB = single nylon braid
PVC = extruded polyvinylchloride

^ Not for specification purposes.

All measurements are in inches unless otherwise stated.

Rectangular Braided Litz

The Type 7 braided Litz constructions shown below are used primarily in high frequency grounding applications, or where special inductor designs require high aspect ratio conductors. We have listed only the most popular constructions and frequency ranges. Specific sizes utilizing almost any wire gauge are available to meet customer specification.

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS/1000 FT	Construction
RECOMMENDED OPERATING FREQUENCY - 1 KHZ TO 15 KHZ								
10	9600	96	30	H	.363	.073	33	24-4-30
9	12000	120	30	H	.435	.073	41	24-5-30
8	16800	168	30	H	.508	.073	58	24-7-30
6	24000	240	30	H	.580	.109	83	24-10-30
5	36000	360	30	H	.725	.109	124	24-15-30
5	33600	336	30	H	1.600	.073	121	48-7-30
4	48000	480	30	H	.870	.145	173	24-20-30
3	64800	648	30	H	1.090	.145	227	24-27-30
2	76800	768	30	H	1.160	.145	279	24-32-30
1/0	105600	1056	30	H	1.450	.145	373	24-44-30
2/0	153600	1536	30	H	2.320	.181	526	48-32-30
3/0	168000	1680	30	H	2.610	.181	569	48-35-30
4/0	249600	2496	30	H	2.900	.181	824	48-52-30
RECOMMENDED OPERATING FREQUENCY - 15 KHZ TO 50 KHZ								
22	800	32	36	H	.075	.038	2.79	16-2-36
18	1600	64	36	H	.113	.038	5.41	16-4-36
16	2400	96	36	H	.188	.038	8.50	24-4-36
14	4200	168	36	H	.263	.038	15.00	24-7-36
12	7200	288	36	H	.450	.038	26.00	48-6-36
10	9600	384	36	H	.450	.076	33.00	24-16-36
9	13200	528	36	H	.750	.076	46.00	48-11-36
8	18000	720	36	H	.750	.075	63.00	48-15-36
6	26400	1056	36	H	1.050	.075	96.00	48-22-36
4	40200	1608	36	H	.900	.113	143.00	24-67-36
2	72000	2880	36	H	1.500	.113	265.00	48-60-36
1/0	100800	4032	36	H	1.950	.150	376.00	48-84-36

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

Rectangular Compacted Litz*

The rectangular compacted Type 8 Litz constructions listed in this section are designed with copper densities from 60 to 75 percent of the cable's cross sectional area. This type Litz is particularly suited for high frequency motor, generator, transformer and inverter windings where limited space necessitates a conductor with excellent fill factor and copper density.

New England Wire has pioneered the development of Type 8 Litz designs including square configurations as well as the rectangular constructions listed. Please consult our design team for the Type 8 designs requiring specific wire sizes or dimensions.

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT^	Construction
RECOMMENDED OPERATING FREQUENCY - 400 HZ TO 5 KHZ · The following designs utilize monolithic conductors for the base group.									
4	46403	7	12	H	.327	.152	140.0	.262	7X12
3	53032	8	12	H	.374	.152	160.0	.229	8X12
3	59661	9	12	H	.421	.152	180.0	.204	9X12
2	66290	10	12	H	.468	.152	200.0	.184	10X12
2	72919	11	12	H	.515	.152	220.0	.167	11X12
2	79548	12	12	H	.533	.152	240.0	.153	12X12
1	86177	13	12	H	.575	.152	260.0	.141	13X12
1	92806	14	12	H	.619	.152	280.0	.131	14X12
1	99435	15	12	H	.661	.152	300.0	.122	15X12
1/0	106064	16	12	H	.704	.152	320.0	.115	16X12
1/0	112693	17	12	H	.747	.152	341.0	.108	17X12
1/0	119322	18	12	H	.789	.152	361.0	.102	18X12
6	28763	7	14	H	.262	.121	88.0	.416	7X14
5	32872	8	14	H	.299	.121	101.0	.364	8X14
5	36981	9	14	H	.337	.121	113.0	.324	9X14
4	41090	10	14	H	.374	.121	126.0	.291	10X14
4	45199	11	14	H	.392	.121	138.0	.265	11X14
4	49308	12	14	H	.426	.121	151.0	.243	12X14
3	53417	13	14	H	.460	.121	163.0	.224	13X14
3	57526	14	14	H	.495	.121	176.0	.208	14X14
3	61635	15	14	H	.528	.121	189.0	.194	15X14
2	65744	16	14	H	.563	.121	201.0	.182	16X14
2	69853	17	14	H	.597	.121	214.0	.171	17X14
2	73962	18	14	H	.631	.121	226.0	.162	18X14
2	78071	19	14	H	.666	.121	239.0	.153	19X14
1	82180	20	14	H	.700	.121	251.0	.146	20X14
1	86289	21	14	H	.735	.121	264.0	.139	21X14
1	90398	22	14	H	.769	.121	277.0	.132	22X14
1	94507	23	14	H	.802	.121	289.0	.127	23X14
1	98616	24	14	H	.837	.121	302.0	.121	24X14
7	18067	7	16	H	.210	.097	55.7	.663	7X16
7	20648	8	16	H	.240	.097	63.6	.581	8X16
7	23229	9	16	H	.270	.097	71.6	.516	9X16
6	25810	10	16	H	.299	.097	79.5	.464	10X16
6	28391	11	16	H	.329	.097	87.5	.422	11X16
6	30972	12	16	H	.341	.097	95.4	.387	12X16
5	33553	13	16	H	.368	.097	103.0	.357	13X16

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

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^ Not for specification purposes.

Rectangular Compacted Litz*, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT.^	Construction
RECOMMENDED OPERATING FREQUENCY - 400 HZ TO 5 KHZ (CONTINUED) · The following designs utilize monolithic conductors for the base group.									
5	36134	14	16	H	.396	.097	111.0	.332	14X16
5	38715	15	16	H	.423	.097	119.0	.310	15X16
4	41296	16	16	H	.451	.097	127.0	.290	16X16
4	43877	17	16	H	.478	.097	135.0	.273	17X16
4	46458	18	16	H	.506	.097	143.0	.258	18X16
4	49039	19	16	H	.534	.097	151.0	.244	19X16
3	51620	20	16	H	.561	.097	159.0	.232	20X16
3	54201	21	16	H	.588	.097	167.0	.221	21X16
3	56782	22	16	H	.616	.097	175.0	.211	22X16
3	59363	23	16	H	.643	.097	183.0	.202	23X16
3	61944	24	16	H	.671	.097	191.0	.194	24X16
10	11368	7	18	H	.168	.078	35.1	1.054	7X18
9	12992	8	18	H	.192	.078	40.2	.923	8X18
9	14616	9	18	H	.216	.078	45.2	.820	9X18
8	16240	10	18	H	.240	.078	50.2	.738	10X18
8	17864	11	18	H	.252	.078	55.2	.671	11X18
8	19488	12	18	H	.273	.078	60.2	.615	12X18
7	21112	13	18	H	.295	.078	65.3	.568	13X18
7	22736	14	18	H	.317	.078	70.3	.527	14X18
7	24360	15	18	H	.339	.078	75.3	.492	15X18
6	25984	16	18	H	.361	.078	80.3	.461	16X18
6	27608	17	18	H	.383	.078	85.3	.434	17X18
6	29232	18	18	H	.405	.078	90.4	.410	18X18
6	30856	19	18	H	.428	.078	95.4	.388	19X18
5	32480	20	18	H	.449	.078	100.0	.369	20X18
5	34104	21	18	H	.472	.078	105.0	.351	21X18
5	35728	22	18	H	.493	.078	110.0	.335	22X18
5	37352	23	18	H	.500	.078	115.0	.321	23X18
5	38976	24	18	H	.538	.078	120.0	.308	24X18
12	7168	7	20	H	.132	.062	22.1	1.670	7X20
11	8192	8	20	H	.149	.062	25.3	1.460	8X20
11	9216	9	20	H	.167	.062	28.4	1.300	9X20
10	10240	10	20	H	.184	.062	31.6	1.170	10X20
10	11264	11	20	H	.201	.062	34.8	1.060	11X20
10	12288	12	20	H	.219	.062	37.9	.974	12X20
9	13312	13	20	H	.236	.062	41.1	.899	13X20
9	14336	14	20	H	.254	.062	44.2	.835	14X20
9	15360	15	20	H	.272	.062	47.4	.779	15X20
8	16384	16	20	H	.289	.062	50.6	.731	16X20
8	17408	17	20	H	.307	.062	53.7	.688	17X20
8	18432	18	20	H	.325	.062	56.9	.650	18X20
8	19456	19	20	H	.342	.062	60.0	.615	19X20
7	20480	20	20	H	.360	.062	63.2	.585	20X20

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

****New England U.S. Patent 4439256***
^ Not for specification purposes.

Rectangular Compacted Litz*, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT	Construction
RECOMMENDED OPERATING FREQUENCY - 400 HZ TO 5 KHZ (CONTINUED) · The following designs utilize monolithic conductors for the base group.									
7	21504	21	20	H	.378	.062	66.4	.557	21X20
7	22528	22	20	H	.395	.062	69.5	.531	22X20
7	23552	23	20	H	.413	.062	72.7	.508	23X20
7	24576	24	20	H	.431	.062	75.8	.487	24X20
14	4480	7	22	H	.108	.050	13.9	2.69	7X22
13	5120	8	22	H	.120	.050	15.9	2.35	8X22
13	5760	9	22	H	.133	.050	17.9	2.09	9X22
12	6401	10	22	H	.147	.050	19.9	1.88	10X22
12	7041	11	22	H	.161	.050	21.9	1.71	11X22
12	7681	12	22	H	.175	.050	23.9	1.57	12X22
11	8321	13	22	H	.189	.050	25.9	1.45	13X22
11	8961	14	22	H	.204	.050	27.9	1.34	14X22
11	9601	15	22	H	.218	.050	29.9	1.25	15X22
10	10241	16	22	H	.232	.050	31.8	1.18	16X22
10	10881	17	22	H	.246	.050	33.8	1.11	17X22
15	3636	9	24	H	.105	.038	11.3	3.30	9X24
14	4040	10	24	H	.116	.038	12.6	2.97	10X24
14	4444	11	24	H	.129	.038	13.9	2.70	11X24
14	4848	12	24	H	.140	.038	15.1	2.48	12X24
13	5252	13	24	H	.152	.038	16.4	2.28	13X24
13	5656	14	24	H	.163	.038	17.6	2.12	14X24
13	6060	15	24	H	.176	.038	18.9	1.98	15X24
12	6464	16	24	H	.187	.038	20.2	1.86	16X24
12	6868	17	24	H	.199	.038	21.4	1.75	17X24
RECOMMENDED OPERATING FREQUENCY - 60 HZ TO 1 KHZ · The following designs utilize 7 strand concentric conductors for the base group.									
2	79576	49	18	H	.495	.233	250.0	.153	7X7X18
1	90944	56	18	H	.559	.233	285.0	.134	8X7X18
1	102312	63	18	H	.624	.233	321.0	.119	9X7X18
1/0	113680	70	18	H	.689	.233	357.0	.107	10X7X18
1/0	125048	77	18	H	.755	.233	392.0	.097	11X7X18
2/0	136416	84	18	H	.820	.233	428.0	.089	12X7X18
4	50176	49	20	H	.396	.187	157.0	.242	7X7X20
3	57344	56	20	H	.448	.187	180.0	.212	8X7X20
3	64512	63	20	H	.500	.187	202.0	.188	9X7X20
2	71680	70	20	H	.552	.187	225.0	.170	10X7X20
2	78848	77	20	H	.604	.187	247.0	.154	11X7X20
1	86016	84	20	H	.657	.187	269.0	.141	12X7X20
1	93184	91	20	H	.709	.187	292.0	.130	13X7X20
1	100352	98	20	H	.768	.187	314.0	.121	14X7X20
1/0	107520	105	20	H	.815	.187	337.0	.113	15X7X20
1/0	114688	112	20	H	.868	.187	359.0	.106	16X7X20

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

****New England U.S. Patent 4439256***

^ Not for specification purposes.

Rectangular Compacted Litz*, *continued*

Equivalent AWG	Circular Mil Area	Number of Strands	AWG of Strand	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS./1000 FT.	Direct Current Resistance OHMS/1000 FT*.	Construction
RECOMMENDED OPERATING FREQUENCY - 60 HZ TO 1 KHZ (CONTINUED) · The following designs utilize 7 strand concentric cnductors for the base group.									
6	31368	49	22	H	.317	.150	99.0	.389	7X7X22
5	35848	56	22	H	.359	.150	113.0	.341	8X7X22
5	40329	63	22	H	.400	.150	127.0	.303	9X7X22
4	44810	70	22	H	.442	.150	141.0	.273	10X7X22
4	49291	77	22	H	.484	.150	156.0	.248	11X7X22
3	53772	84	22	H	.526	.150	170.0	.227	12X7X22
3	58253	91	22	H	.568	.150	184.0	.210	13X7X22
3	62734	98	22	H	.611	.150	198.0	.195	14X7X22
2	67215	105	22	H	.653	.150	212.0	.182	15X7X22
2	71696	112	22	H	.695	.150	226.0	.170	16X7X22
2	76177	119	22	H	.738	.150	240.0	.160	17X7X22
2	80658	126	22	H	.780	.150	255.0	.151	18X7X22
1	85139	133	22	H	.823	.150	269.0	.143	19X7X22
1	89614	140	22	H	.864	.150	283.0	.136	20X7X22
8	19796	49	24	H	.257	.121	62.7	.615	7X7X24
7	22624	56	24	H	.290	.121	71.6	.538	8X7X24
7	25452	63	24	H	.324	.121	80.6	.478	9X7X24
6	28280	70	24	H	.357	.121	89.5	.430	10X7X24
6	31108	77	24	H	.391	.121	98.5	.391	11X7X24
5	33936	84	24	H	.425	.121	107.0	.359	12X7X24
5	36764	91	24	H	.459	.121	116.0	.331	13X7X24
5	39592	98	24	H	.494	.121	125.0	.307	14X7X24
4	42420	105	24	H	.528	.121	134.0	.287	15X7X24
4	45248	112	24	H	.562	.121	143.0	.269	16X7X24
4	48076	119	24	H	.596	.121	152.0	.253	17X7X24
4	50904	126	24	H	.630	.121	161.0	.239	18X7X24
3	53732	133	24	H	.665	.121	170.0	.226	19X7X24
3	56560	140	24	H	.699	.121	179.0	.215	20X7X24
3	59388	147	24	H	.734	.121	187.0	.205	21X7X24
3	62216	154	24	H	.767	.121	197.0	.196	22X7X24
2	65044	161	24	H	.801	.121	206.0	.187	23X7X24
2	67872	168	24	H	.836	.121	215.0	.179	24X7X24
10	12390	49	26	H	.206	.097	39.7	.987	7X7X26
9	14160	56	26	H	.233	.097	45.4	.864	8X7X26
9	15930	63	26	H	.260	.097	51.1	.768	9X7X26
8	17700	70	26	H	.287	.097	56.8	.691	10X7X26
8	19470	77	26	H	.314	.097	62.4	.628	11X7X26
7	21240	84	26	H	.342	.097	68.1	.576	12X7X26
7	23010	91	26	H	.369	.097	73.8	.532	13X7X26
7	24780	98	26	H	.397	.097	79.5	.494	14X7X26
6	26550	105	26	H	.424	.097	85.2	.461	15X7X26
6	28320	112	26	H	.452	.097	90.8	.432	16X7X26
6	30090	119	26	H	.479	.097	96.5	.407	17X7X26
6	31860	126	26	H	.507	.097	102.0	.384	18X7X26
5	33630	133	26	H	.534	.097	108.0	.364	19X7X26

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

****New England U.S. Patent 4439256***
^ Not for specification purposes.

Rectangular Compacted Litz*, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000 FT	Construction
RECOMMENDED OPERATING FREQUENCY - 60 HZ TO 1 KHZ (CONTINUED) · The following designs utilize 7 strand concentric conductors for the base group.									
5	35400	140	26	H	.562	.097	114.0	.346	20X7X26
5	37170	147	26	H	.590	.097	119.0	.329	21X7X26
5	38940	154	26	H	.617	.097	125.0	.314	22X7X26
5	40710	161	26	H	.644	.097	131.0	.300	23X7X26
4	42480	168	26	H	.672	.097	136.0	.288	24X7X26
RECOMMENDED OPERATING FREQUENCY - 60 HZ TO 10 KHZ · The following designs utilize 7 strand concentric conductors for the base group.									
12	7784	49	28	H	.151	.078	25.1	1.50	7X7X28
11	8896	56	28	H	.173	.078	28.6	1.360	8X7X28
11	10008	63	28	H	.194	.078	32.2	1.210	9X7X28
10	11120	70	28	H	.216	.078	35.8	1.090	10X7X28
10	12232	77	28	H	.238	.078	39.4	.991	11X7X28
9	13344	84	28	H	.259	.078	43.0	.909	12X7X28
9	14456	91	28	H	.281	.078	46.6	.839	13X7X28
9	15568	98	28	H	.302	.078	50.1	.779	14X7X28
8	16680	105	28	H	.324	.078	53.7	.727	15X7X28
8	17792	112	28	H	.346	.078	57.3	.681	16X7X28
8	18904	119	28	H	.367	.078	60.9	.641	17X7X28
8	20016	126	28	H	.389	.078	64.5	.606	18X7X28
7	21128	133	28	H	.410	.078	68.0	.574	19X7X28
7	22240	140	28	H	.432	.078	71.6	.545	20X7X28
7	23352	147	28	H	.453	.078	75.2	.519	21X7X28
7	24464	154	28	H	.475	.078	78.8	.496	22X7X28
7	25576	161	28	H	.497	.078	82.4	.474	23X7X28
14	4900	49	30	H	.122	.063	15.8	2.48	7X7X30
13	5600	56	30	H	.139	.063	18.1	2.17	8X7X30
13	6300	63	30	H	.157	.063	20.3	1.93	9X7X30
12	7000	70	30	H	.174	.063	22.6	1.74	10X7X30
12	7700	77	30	H	.191	.063	24.9	1.58	11X7X30
11	8400	84	30	H	.209	.063	27.1	1.45	12X7X30
11	9100	91	30	H	.226	.063	29.4	1.34	13X7X30
11	9800	98	30	H	.244	.063	31.6	1.24	14X7X30
10	10500	105	30	H	.261	.063	33.9	1.14	15X7X30
10	11200	112	30	H	.278	.063	36.2	1.09	16X7X30
10	11900	119	30	H	.296	.063	38.4	1.02	17X7X30

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

***New England U.S. Patent 4439256**

***^ Not for specification purposes.**

Rectangular Compacted Litz*, *continued*

Equivalent AWG	Circular Mil Area	Number of Wires	AWG of Wire	Film Coating[1]	Nominal Width	Nominal Thickness	Nominal LBS/1000 FT	Direct Current Resistance OHMS/1000FT	Construction
RECOMMENDED OPERATING FREQUENCY - 10 HZ TO 50 KHZ · The following designs utilize 7 strand concentric and bonded* conductors for the base group.									
17	2470	49	33	H	.082	.045	8.0	4.97	7X7X33
16	2822	56	33	H	.094	.045	9.2	4.35	8X7X33
16	3176	63	33	H	.106	.045	10.3	3.86	9X7X33
15	3529	70	33	H	.118	.045	11.4	3.47	10X7X33
15	3882	77	33	H	.129	.045	12.6	3.16	11X7X33
14	4234	84	33	H	.141	.045	13.7	2.90	12X7X33
14	4587	91	33	H	.153	.045	14.9	2.68	13X7X33
14	4940	98	33	H	.165	.045	16.0	2.48	14X7X33
13	5293	105	33	H	.177	.045	17.2	2.32	15X7X33
13	5646	112	33	H	.188	.045	18.3	2.17	16X7X33
13	5999	119	33	H	.200	.045	19.5	2.05	17X7X33
20	1225	49	36	H	.058	.032	4.0		7X7X36
19	1400	56	36	H	.066	.032	4.6	10.14	8X7X36
19	1575	63	36	H	.074	.032	5.1	8.87	9X7X36
18	1750	70	36	H	.082	.032	5.7	7.88	10X7X36
18	1925	77	36	H	.091	.032	6.3	7.10	11X7X36
17	2100	84	36	H	.099	.032	6.8	6.28	12X7X36
17	2275	91	36	H	.107	.032	7.4	5.91	13X7X36
17	2450	98	36	H	.115	.032	8.0	5.46	14X7X36
16	2625	105	36	H	.124	.032	8.6	5.07	15X7X36
16	2800	112	36	H	.132	.032	9.1	4.73	16X7X36
16	2975	119	36	H	.140	.032	9.7	4.43 4.17	17X7X36

1 H = heavy-film coating

All measurements are in inches unless otherwise stated.

****New England U.S. Patent 4439256***
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Single Film Coated - Round

AWG Size	Bare Wire Diameter Nominal	Film Addition Min	Film Addition Max.	Min OD	Nominal OD	Max OD	Weight @ 20˚C - 68˚ F LBS/1000 FT Nominal	Weight @ 20˚C - 68˚F FT/LB Nominal	Resistance @ 20˚C - 68˚F OHMS/1000 FT Nominal	Resistance @ 20˚C - 68˚ F OHMS/LB Nominal	Wires Per SQ Inch
8	.1285	.0016	.0026	.1288	.1306	.1324	50.23	19.91	.6281	.0125	59
9	.1144	.0016	.0026	.1149	.1165	.1181	39.80	25.13	.7925	.01991	74
10	.1019	.0015	.0025	.1024	.1039	.1054	31.57	31.68	.9987	.03163	93
11	.0907	.0015	.0025	.0913	.0927	.0941	25.05	39.92	1.261	.0503	116
12	.0808	.0014	.0024	.0814	.0827	.0840	19.93	50.18	1.588	.0797	146
13	.0720	.0014	.0023	.0727	.0739	.0750	15.81	63.25	2.001	.1266	183
14	.0641	.0016	.0023	.0651	.0658	.0666	12.50	80.00	2.524	.2019	230
15	.0571	.0015	.0022	.0580	.0587	.0594	9.95	100.50	3.181	.3197	288
16	.0508	.0014	.0021	.0517	.0524	.0531	7.89	126.7	4.018	.5093	363
17	.0453	.0014	.0020	.0462	.0468	.0475	6.26	159.7	5.054	.8073	455
18	.0403	.0013	.0019	.0412	.0418	.0424	4.97	201.2	6.386	1.2849	572
19	.0359	.0012	.0019	.0367	.0373	.0379	3.95	253.2	8.046	2.037	715
20	.0320	.0012	.0018	.0329	.0334	.0339	3.13	319.5	10.13	3.2364	896
21	.0285	.0011	.0018	.0293	.0298	.0303	2.483	402.7	12.77	5.143	1119
22	.0253	.0011	.0017	.0261	.0266	.0270	1.970	507.6	16.20	8.223	1403
23	.0226	.0010	.0016	.0234	.0238	.0243	1.565	639.0	20.30	12.971	1751
24	.0201	.0010	.0015	.0209	.0213	.0217	1.240	806.5	25.67	20.702	2204
25	.0179	.0009	.0014	.0186	.0190	.0194	.988	1012.1	32.37	32.763	2741
26	.0159	.0009	.0013	.0166	.0170	.0173	.784	1276	41.02	52.32	3460
27	.0142	.0008	.0013	.0149	.0152	.0156	.623	1605	51.44	82.57	4272
28	.0126	.0008	.0012	.0133	.0136	.0140	.495	2020	65.31	131.94	5407
29	.0113	.0007	.0012	.0119	.0122	.0126	.394	2538	81.21	206.12	6610
30	.0100	.0007	.0011	.0106	.0109	.0112	.312	3205	103.7	332.37	8417
31	.0089	.0006	.0010	.0094	.0097	.0100	.248	4032	130.9	527.8	10628
32	.0080	.0006	.0010	.0085	.0088	.0091	.1966	5086	162.0	824.0	12913
33	.0071	.0005	.0009	.0075	.0078	.0081	.1570	6369	205.7	1310	16437
34	.0063	.0005	.0008	.0067	.0070	.0072	.1244	8039	261.3	2100	20408
35	.0056	.0004	.0007	.0059	.0062	.0064	.0989	10111	330.7	3343	26015
36	.0050	.0004	.0007	.0053	.0056	.0058	.0788	12690	414.8	5264	31888
37	.0045	.0003	.0006	.0047	.0050	.0052	.0624	16026	512.1	8207	40000
38	.0040	.0003	.0006	.0042	.0045	.0047	.0494	20243	648.2	13121	49383
39	.0035	.0002	.0005	.0036	.0039	.0041	.0393	25445	846.6	21542	65746
40	.0031	.0002	.0005	.0032	.0035	.0037	.0313	31949	1079	34473	81633
41	.0028	.0002	.0004	.0029	.0031	.0033	.02470	40486	1323	53563	104058
42	.0025	.0002	.0004	.0026	.0028	.0030	.01946	51387	1659	85252	127551
43	.0022	.0002	.0003	.0023	.0025	.0026	.01548	64599	2143	138437	160000
44	.0020	.0001	.0003	.0020	.0022	.0024	.01233	81103	2593	210300	206611
45	.00176	.0001	.00022	.00179	.0019	.00205	.00965	103626	3348	346943	345304
46	.00157	.0001	.00021	.00161	.00173	.00185	.00767	130378	4207	548501	420521
47	.00140	.0001	.00024	.00145	.00158	.00170	.00615	162601	5291	860325	510204
48	.00124	.0001	.00021	.00129	.00140	.00150	.00487	205338	6745	1385010	649773

All measurements are in inches unless otherwise stated.

Heavy Film Coated - Round

AWG Size	Bare Wire Diameter Nominal	Film Addition Min	Film Addition Max.	Min OD	Nominal OD	Max OD	Weight @ 20˚C - 68˚ F LBS/1000 FT Nominal	Weight @ 20˚C - 68˚F FT/LB Nominal	Resistance @ 20˚C - 68˚F OHMS/1000 FT Nominal	Resistance @ 20˚C - 68˚ F OHMS/LB Nominal	Wires Per SQ Inch
8	.1285	.0033	.0044	.1305	.1319	.1332	50.42	19.83	.6281	.01246	57
9	.1144	.0032	.0043	.1165	.1177	.1189	39.97	25.02	.7925	.01983	72
10	.1019	.0031	.0042	.1050	.1056	.1061	31.72	31.53	.9987	.03148	90
11	.0907	.0030	.0041	.0928	.0938	.0948	25.18	39.71	1.261	.0501	112
12	.0808	.0029	.0039	.0829	.0837	.0847	20.03	49.93	1.588	.0793	141
13	.0720	.0028	.0038	.0741	.0749	.0757	15.90	62.89	2.001	.1258	176
14	.0641	.0032	.0037	.0667	.0675	.0682	12.57	79.55	2.524	.2008	221
15	.0571	.0030	.0036	.0595	.0602	.0609	10.01	99.90	3.181	.3178	276
16	.0508	.0029	.0035	.0532	.0539	.0545	7.95	125.79	4.018	.5054	344
17	.0453	.0028	.0034	.0476	.0482	.0488	6.32	158.23	5.054	.7997	429
18	.0403	.0026	.0033	.0425	.0431	.0437	5.02	199.2	6.386	1.2721	536
19	.0359	.0025	.0032	.0380	.0386	.0391	3.99	250.6	8.046	2.0165	668
20	.0320	.0023	.0030	.0340	.0346	.0351	3.16	316.5	10.13	3.2057	835
21	.0285	.0022	.0029	.0304	.0309	.0314	2.51	398.4	12.77	5.088	1041
22	.0253	.0021	.0028	.0271	.0276	.0281	1.99	502.5	16.20	8.141	1303
23	.0226	.0020	.0027	.0244	.0249	.0253	1.59	628.9	20.30	12.767	1613
24	.0201	.0019	.0026	.0218	.0223	.0227	1.260	793.7	25.67	20.373	1993
25	.0179	.0018	.0025	.0195	.0199	.0203	1.005	995.0	32.37	32.209	2475
26	.0159	.0017	.0024	.0174	.0178	.0182	.799	1252	41.02	51.34	3086
27	.0142	.0016	.0022	.0157	.0161	.0164	.634	1577	51.44	81.14	3858
28	.0126	.0016	.0021	.0141	.0144	.0147	.504	1984	65.31	129.58	4823
29	.0113	.0015	.0020	.0127	.0130	.0133	.401	2494	81.21	202.52	5917
30	.0100	.0014	.0019	.0113	.0116	.0119	.318	3145	103.7	326.10	7432
31	.0089	.0013	.0018	.0101	.0105	.0108	.254	3937	130.9	515.4	9070
32	.0080	.0012	.0017	.0091	.0095	.0098	.2019	4953	162.0	802.4	11080
33	.0071	.0011	.0016	.0081	.0085	.0088	.1611	6207	205.7	1276.8	13841
34	.0063	.0010	.0014	.0072	.0075	.0078	.1269	7880	261.3	2059.1	17778
35	.0056	.0009	.0013	.0064	.0067	.0070	.1010	9901	330.7	3274.3	22277
36	.0050	.0008	.0012	.0057	.0060	.0063	.0803	12453	414.8	5166	27778
37	.0045	.0008	.0011	.0052	.0055	.0057	.0641	15601	512.1	7989	33058
38	.0040	.0007	.0010	.0046	.0049	.0051	.0509	19646	648.2	12735	41649
39	.0035	.0006	.0009	.0040	.0043	.0045	.0403	24814	846.6	21007	54083
40	.0031	.0006	.0008	.0036	.0038	.0040	.0319	31348	1079	33824	69252
41	.0028	.0005	.0007	.0032	.0034	.0036	.0252	39683	1323	52500	86505
42	.0025	.0004	.0006	.0028	.0030	.0032	.0199	50251	1659	83367	111111
43	.0022	.0004	.0006	.0025	.0027	.0029	.0159	62893	2143	134780	137174
44	.0020	.0004	.0006	.0023	.0025	.0027	.0127	78740	2593	204173	160000

All measurements are in inches unless otherwise stated.

FILM INSULATIONS

INSULATION	RATING	AWG	ADVANTAGES	CONSIDERATIONS
Polyvinyl Formal	Class 105 MW 15-C	14 - 50	- Excellent abrasion resistance - Excellent compatibility with transformer oils - Good electrical properties - Used in Cryogenic Applications	- Must be stripped before soldering - Should be annealed before application of varnish
Polyurethane	Class 155 MW 79-C Class 180 MW 82-C	30 - 50 24 - 50	- Excellent electrical properties for high Q coils - Easily solderable 390˚C/360˚C - Excellent film adhesion & flexibility - Good moisture & chemical resistance	- Not recommended for applications with the possibility of severe thermal overload
Polyurethane-Nylon	Class 155 MW 80-C Class 180 MW 83-C	10 - 46 25 - 46	- Good electrical properties - Easily solderable 430˚C/390˚C - Excellent film adhesion & flexibility - Improved chemical & mechanical resistance from nylon topcoat - Nylon overcoat provides low coefficient of friction	- Not recommended for applications with the possiblity of severe thermal overload - Nylon topcoat is hygroscopic
Solderable Polyester	Class 180 MW 77-C	14 - 50	- Solderable 470˚C - Excellent thermal properties - Good electrical properties - Good compatibility with varnishes & solvents - Improved thermal overload - Good moisture resistance	- Low abrasion resistance compared to Nylon & amide imide topcoat materials - Preheat before varnishing is recommended
Solderable Polyester Nylon	Class 180 MW 78-C	14-50	- Solderable 470˚C - Excellent thermal properties - Good electrical properties - Good compatibility with varnishes & solvents - Improved thermal overload - Good moisture resistance - Nylon overcoat provides low coefficient of friction	- Nylon topcoat is hygroscopic - Preheat before varnishing is recommended
Polyester(amide)(imide)	Class 200 MW 74-C	34 - 44	- Excellent flexibility & abrasion resistance - Excellent thermal overload - Excellent dielectric strength - Excellent moisture resistance - Good chemical resistance	- Must be stripped before soldering - Not recommended for use in oil-filled transformers - Preheat before varnishing
Polyester/Poly-amideimide Overcoat	Class 200 MW 35-C	8 - 33	- Excellent flexibility & abrasion resistance - Excellent thermal overload - Excellent dielectric strength - Excellent moisture resistance - Good chemical resistance	- Must be stripped before soldering - Preheat before varnishing
Polyimide	Class 240 MW 16-C	10 - 30	- Excellent flexibility - Excellent thermal overload - Excellent radiation resistance - Excellent chemical compatibility - High dielectric strength - Adequate abrasion resistance - Low outgas	- Must be stripped before soldering - Must be annealed before varnishing - Will solvent craze

FIBER & TAPE INSULATIONS

Insulation	Recommended Max. Operating Temperature	Advantages	Limitations
Cotton	105°C	1. Low cost serving. 2. Good resistance to abrasion.	1. Poor space factor compared to Nylon or Celanese. 2. Non-solderable.
Nylon	155°C	1. Good space factor. 2. Excellent abrasion resistance. 3. Solderable.	1. Hygroscopic
Dacron® (POLYESTER)	155°C	1. Good abrasion resistance. 2. Solderable. 3. Slightly higher maximum operating temperature than nylon.	1. Better space factor than Cotton or Glass but poorer space factor than Nylon.
Nomex® (HI-TEMP Aramid)	250°C	1. Good space factor. 2. Good electrical properties at high temperatures.	1. Non-solderable. 2. Higher cost than other fibers.
Glass	260°C	1. Good electrical properties at high temperatures.	1. Space factor equivalent to Cotton. 2. Non-solderable.

Tape Insulation	Recommended Max. Use Temperature	Characteristics
Polyester (PET) Mylar® (heat sealable grades available)	135° C	1. High dielectric strength. 2. Good abrasion often used as binder or moisture barrier under extruded jackets and textile serves or braids.
Nomex® (aromatic polyamide)	200° C (Up to 220° C under certain conditions.)	1. Excellent thermal properties. 2. Excellent electrical properties. 3. Excellent compatibility with varnishes, adhesives and transformer fluids. 4. Thinner grades are flexible. 5. Good resistance to tearing and abrasion.
Polyimide Kapton® (Heat sealable & adhesive grades available)	240° C (Up to 400° C under certain conditions.)	1. Very high dielectric strength. 2. Very good chemial resistance. 3. UL 94 V-0 flame rating. 4. Excellent mechnical properties.
Fiberglass Cloth	Ultimate operating temperature determined by application & glass type.	1. Excellent electrical properties at high temperatures. 2. Conformable. 3. Varnish compatible grades available. 4. Excellent solvent resistance.
Mica	Ultimate operating temperature determined by application & glass type.	1. Excellent electrical properties at high temperatures. 2. Flame resistant. 3. Retains useful electrical properties during & after exposure to fire.

NOTE: Dacron®, Nomex®, Mylar® and Kapton® are DuPont Registered Trademarks.

NEWind® Specialty Winding Wire

TECHNICAL INFORMATION

The most common winding wire is magnet wire in either its single-end or stranded “Litz” form. Magnet wire coating, however is generally not sufficient for insulating between winding turns, separate windings and between the winding and ground as the magnet wire coating can easily be damaged. It is for this reason that additional interleaved insulation is needed.

NEWind® Specialty Winding Wire eliminates the need for this additional insulation by insulating conductors with thin layers of insulation extruded in single (Basic), double (Supplemental) or triple (Reinforced) layers. Basic NEWind® is recommended when a rating of 600 Vpk and the smallest possible diameter are required. Supplemental and Reinforced NEWind® are used where a more rugged product is required to withstand mechnical handling and maintain an electrical rating up to 1000 Vpk. These products are also approved under our NE-F1 Electrical Insulation System.

Multiple Insulation on Complex Bundles

Multiple Insulation on Single Strand

PRODUCT DETAILS

- UL 60950/IEC 60950 Annex U Approved
- UL 1446 Electrical Insulation System: NE-F1 - Class F (155˚C)
- Single-End, Stranded and Litz Conductors
- Supplementary and Reinforced Insulations

MATERIAL PROPERTIES

	ETFE	FEP	PFA
Temperature Rating*	155˚C	180˚C	200˚C*
Layer Thickness Basic (Minimum)	.0015"	.002"	.002"
Total Thickness Supplementary (Minimum)	.003"	.004"	.004"
Total Thickness Reinforced (Minimum)	.0045"	.006"	.006"

*UL60950 & VDE 60950 have a maximum temperature rating of 180˚C Class H.

NEWind® - Solid/PFA Insulated Conductors

DESCRIPTION: Specialty winding wire for transformers and coils that doesn't require interleaving insulation between layers.

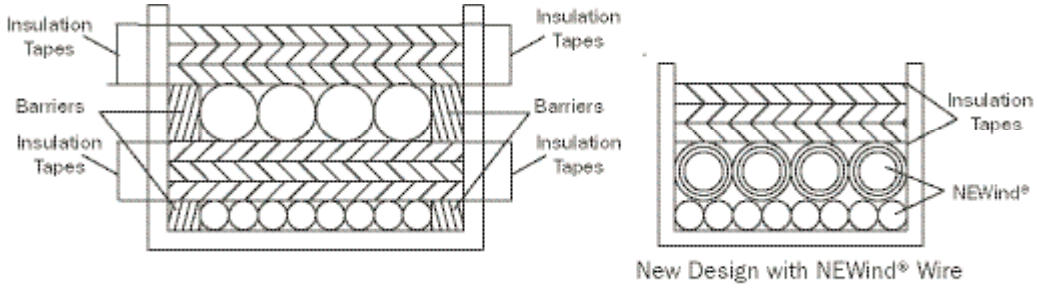
Conductor Material: Solid Copper
Insulation Thickness: .002" min per layer
Note: .0015" min per layer available as custom design.
Voltage Rating: Single layer 600 Vpk
Double & Triple layers 1000 Vpk
Temperature Rating: UL/VDE Class H 180˚/C
Dielectric Strength: 2000 V/mil nominal

Single Layer: UL 60950 Annex U UL File E205791
Double Layer: UL 60950 Annex U UL File E205791
IEC 60950 Annex U VDE Reg. No.135446
Triple Layer: UL 60950 Annex U UL File E205791
IEC 60950 Annex U VDE Reg. No.135447

CONDUCTOR		DC RESISTANCE		SINGLE INSULATION			DOUBLE INSULATION			TRIPLE INSULATION		
AWG	O.D.	Bare Copper	Tinned Copper	PART NUMBER	O.D.	LBS/ 1000 FT	PART NUMBER	O.D.	LBS/ 1000 FT	PART NUMBER	O.D.	LBS/ 1000 FT
18	.0403	6.516	6.995	W18S2.0PXTC1A	.0443	5.061	W18D2.0PXXTC1A	.463	5.217	W18T2.0PXXXTC1A	.0493	5.383
19	.0359	8.211	8.815	W19S2.0PXTC1A	.0389	4.031	W19D2.0PXXTC1A	.419	4.171	W19T2.0PXXXTC1A	.0449	4.322
20	.0320	10.330	11.090	W20S2.0PXTC1A	.0350	3.216	W20D2.0PXXTC1A	.380	3.343	W20T2.0PXXXTC1A	.0410	3.480
21	.0285	13.030	13.990	W21S2.0PXTC1A	.0315	2.563	W21D2.0PXXTC1A	.345	2.677	W21T2.0PXXXTC1A	.0375	2.802
22	.0253	16.530	17.750	W22S2.0PXTC1A	.0283	2.031	W22D2.0PXXTC1A	.313	2.137	W22T2.0PXXXTC1A	.0343	2.248
23	.0226	20.720	22.240	W23S2.0PXTC1A	.0256	1.630	W23D2.0PXXTC1A	.286	1.724	W23T2.0PXXXTC1A	.0316	1.828
24	.0201	26.190	28.120	W24S2.0PXTC1A	.0231	1.298	W24D2.0PXXTC1A	.261	1.383	W24T2.0PXXXTC1A	.0291	1.479
25	.0179	33.030	35.460	W25S2.0PXTC1A	.0209	1.037	W25D2.0PXXTC1A	.239	1.115	W25T2.0PXXXTC1A	.0269	1.203
26	.0159	41.860	44.940	W26S2.0PXTC1A	.0189	.826	W26D2.0PXXTC1A	.219	.897	W26T2.0PXXXTC1A	.0249	.978
27	.0142	52.480	56.340	W27S2.0PXTC1A	.0172	.665	W27D2.0PXXTC1A	.202	.730	W27T2.0PXXXTC1A	.0232	.805
28	.0126	66.660	71.560	W28S2.0PXTC1A	.0156	.530	W28D2.0PXXTC1A	.186	.589	W28T2.0PXXXTC1A	.0216	.659
29	.0113	82.880	88.970	W29S2.0PXTC1A	.0143	.431	W29D2.0PXXTC1A	.173	.486	W29T2.0PXXXTC1A	.0203	.551
30	.0100	105.800	113.600	W30S2.0PXTC1A	.0130	.343	W30D2.0PXXTC1A	.160	.393	W30T2.0PXXXTC1A	.0190	.454
31	.0089	133.900	143.800	W31S2.0PXTC1A	.0119	.276	W31D2.0PXXTC1A	.149	.322	W31T2.0PXXXTC1A	.0179	.379
32	.0080	166.200	178.400	W32S2.0PXTC1A	.0110	.227	W32D2.0PXXTC1A	.140	.270	W32T2.0PXXXTC1A	.0170	.324
33	.0071	211.700	228.200	W33S2.0PXTC1A	.0101	.782	W33D2.0PXXTC1A	.131	.223	W33T2.0PXXXTC1A	.0161	.273
34	.0063	269.800	289.600	W34S2.0PXTC1A	.0093	.147	W34D2.0PXXTC1A	.123	.185	W34T2.0PXXXTC1A	.0153	.233
35	.0056	342.800	368.100	W35S2.0PXTC1A	.0086	.120	W35D2.0PXXTC1A	.116	.155	W35T2.0PXXXTC1A	.0146	.200
36	.0050	431.900	463.700	W36S2.0PXTC1A	.0080	.098	W36D2.0PXXTC1A	.110	.131	W36T2.0PXXXTC1A	.0140	.175
37	.0045	535.700	575.100	W37S2.0PXTC1A	.0075	.082	W37D2.0PXXTC1A	.105	.113	W37T2.0PXXXTC1A	.0135	.155
38	.0040	681.900	732.000	W38S2.0PXTC1A	.0070	.068	W38D2.0PXXTC1A	.100	.097	W38T2.0PXTXXC1A	.0130	.137
39	.0035	897.100	963.100	W39S2.0PXTC1A	.0065	.054	W39D2.0PXXTC1A	.095	.082	W39T2.0PXXXTC1A	.0125	.120
40	.0031	1152.000	1237.000	W40S2.0PXTC1A	.0061	.045	W40D2.0PXXTC1A	.091	.071	W40T2.0PXXXTC1A	.0121	.108

NOTES:
1. Double and triple insulated conductors are included in UL approved Electrical Insulation System designated as NE-F1.
2. Conductor DC resistance is provided as maximum Ohms/1000 Ft @ 20˚C.
3. Our standard colors for these products include: clear, white, black, red, green, yellow, blue, brown, orange, gray and violet. Most are RoHS Compliant; please contact our design team to discuss your specific requirement.

Use of NEWind® Specialty Winding insulated conductors result in much smaller transformers due to decrease in number of winding wires required and removal of barrier tape and interleaved insulation tapes. Available in single layer of insulation, Supplementary (double layer) and Reinforced (triple layer) styles.



New Design with NEWind® Wire

USE: Telecommunication devices, laptop computers, digital cameras, games and other electronic devices such as electronic transformers, power adapters, switching mode power supply modules, battery chargers for mobile phones, motors and coils.

All measurements are in inches unless otherwise stated.

www.newenglandwire.com
Tel: 603.838.6624

NEWind® - Solid/FEP Insulated Conductors

DESCRIPTION: Specialty winding wire for transformers and coils that doesn't require interleaving insulation between layers.

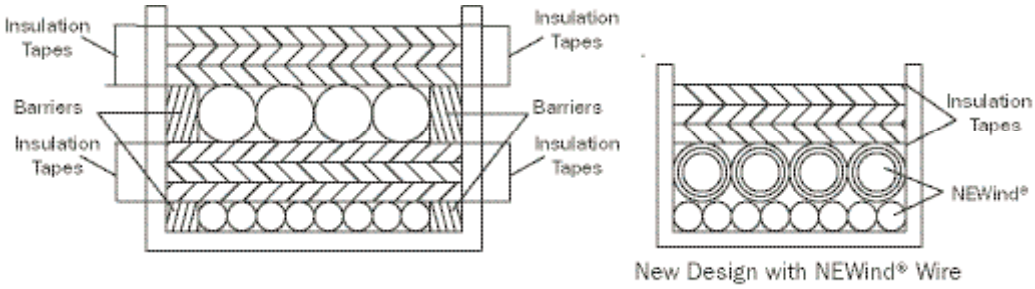
Conductor Material: Solid Copper
Insulation Thickness: .002" min per layer
Voltage Rating: Basic - 600 Vpk
Supplemental & Reinforced - 1000 Vpk
Temperature Rating: UL/VDE Class H 180˚ C
Dielectric Strength: 2000 V/mil nominal

Single Layer:	UL 60950 Annex U	UL File E205791
Double Layer:	UL 60950 Annex U	UL File E205791
	IEC 60950 Annex U	VDE Reg. No. 135443
Triple Layer:	UL 60950 Annex U	UL File E205791
	IEC 60950 Annex U	VDE Reg. No. 135441

CONDUCTOR		DC RESISTANCE		SINGLE INSULATION			DOUBLE INSULATION			TRIPLE INSULATION		
AWG	O.D.	Bare Copper	Tinned Copper	PART NUMBER	O.D.	LBS/ 1000 FT	PART NUMBER	O.D.	LBS/ 1000 FT	PART NUMBER	O.D.	LBS/ 1000 FT
18	.0403	6.516	6.995	W18S2.0FXTC1A	.0443	5.164	W18D2.0FXXTC1A	.0483	5.435	W18T2.0FXXXTC1A	.0523	5.730
19	.0359	8.211	8.815	W19S2.0FXTC1A	.0399	4.123	W19D2.0FXXTC1A	.0439	4.369	W19T2.0FXXXTC1A	.0479	4.637
20	.0320	10.330	11.090	W20S2.0FXTC1A	.0360	3.299	W20D2.0FXXTC1A	.0400	3.521	W20T2.0FXXXTC1A	.0440	3.767
21	.0285	13.030	13.990	W21S2.0FXTC1A	.0325	2.637	W21D2.0FXXTC1A	.0365	2.839	W21T2.0FXXXTC1A	.0405	3.065
22	.0253	16.530	17.750	W22S2.0FXTC1A	.0293	2.097	W22D2.0FXXTC1A	.0333	2.281	W22T2.0FXXXTC1A	.0373	2.487
23	.0226	20.720	22.240	W23S2.0FXTC1A	.0266	1.690	W23D2.0FXXTC1A	.0306	1.858	W23T2.0FXXXTC1A	.0346	2.049
24	.0201	26.190	28.120	W24S2.0FXTC1A	.0241	1.352	W24D2.0FXXTC1A	.0281	1.505	W24T2.0FXXXTC1A	.0321	1.681
25	.0179	33.030	35.460	W25S2.0FXTC1A	.0219	1.086	W25D2.0FXXTC1A	.0259	1.226	W25T2.0FXXXTC1A	.0299	1.390
26	.0159	41.860	44.940	W26S2.0FXTC1A	.0199	.870	W26D2.0FXXTC1A	.0239	.998	W26T2.0FXXXTC1A	.0279	1.150
27	.0142	52.480	56.340	W27S2.0FXTC1A	.0182	.705	W27D2.0FXXTC1A	.0222	.824	W27T2.0FXXXTC1A	.0262	.965
28	.0126	66.660	71.560	W28S2.0FXTC1A	.0166	.566	W28D2.0FXXTC1A	.0206	.675	W28T2.0FXXXTC1A	.0246	.807
29	.0113	82.880	88.970	W29S2.0FXTC1A	.0153	.464	W29D2.0FXXTC1A	.0193	.566	W29T2.0FXXXTC1A	.0233	.690
30	.0100	105.800	113.600	W30S2.0FXTC1A	.0140	.373	W30D2.0FXXTC1A	.0180	.467	W30T2.0FXXXTC1A	.0220	.584
31	.0089	133.900	143.800	W31S2.0FXTC1A	.0129	.304	W31D2.0FXXTC1A	.0169	.391	W31T2.0FXXXTC1A	.0209	.502
32	.0080	166.200	178.400	W32S2.0FXTC1A	.0120	.252	W32D2.0FXXTC1A	.0160	.334	W32T2.0FXXXTC1A	.0200	.440
33	.0071	211.700	228.200	W33S2.0FXTC1A	.0111	.206	W33D2.0FXXTC1A	.0151	.283	W33T2.0FXXXTC1A	.0191	.383
34	.0063	269.800	289.600	W34S2.0FXTC1A	.0103	.169	W34D2.0FXXTC1A	.0143	.241	W34T2.0FXXXTC1A	.0183	.336
35	.0056	342.800	368.100	W35S2.0FXTC1A	.0096	.139	W35D2.0FXXTC1A	.0136	.207	W35T2.0FXXXTC1A	.0176	.299
36	.0050	431.900	463.700	W36S2.0FXTC1A	.0090	.117	W36D2.0FXXTC1A	.0130	.181	W36T2.0FXXXTC1A	.0170	.269
37	.0045	535.700	575.100	W37S2.0FXTC1A	.0085	.099	W37D2.0FXXTC1A	.0125	.161	W37T2.0FXXXTC1A	.0165	.246
38	.0040	681.900	732.000	W38S2.0FXTC1A	.0080	.084	W38D2.0FXXTC1A	.0120	.142	W38T2.0FXXXTC1A	.0160	.224
39	.0035	897.100	963.100	W39S2.0FXTC1A	.0075	.069	W39D2.0FXXTC1A	.0115	.125	W39T2.0FXXXTC1A	.0155	.204
40	.0031	1152.000	1237.000	W40S2.0FXTC1A	.0071	.059	W40D2.0FXXTC1A	.0111	.112	W40T2.0FXXXTC1A	.0151	.189

NOTES:
1. Double and triple insulated conductors are included in UL approved Electrical Insulation System designated as NE-F1.
2. Conductor DC resistance is provided as maximum Ohms/1000 Ft @ 20˚C.
3. Our standard colors for these products include: clear, white, black, red, green, yellow, blue, brown, orange, gray and violet. Most are RoHS Compliant; please contact our design team to discuss your specific requirement.

Use of NEWind® Specialty Winding insulated conductors result in much smaller transformers due to decrease in number of winding wires required and removal of barrier tape and interleaved insulation tapes. Available in single layer of insulation,Supplementary (double layer) and Reinforced (triple layer) styles.



New Design with NEWind® Wire

USE: Telecommunication devices, laptop computers, digital cameras, games and other electronic devices such as electronic transformers, power adapters, switching mode power supply modules, battery chargers for mobile phones, motors and coils.

All measurements are in inches unless otherwise stated.

NEWind® - Solid/ETFE Insulated Conductors

DESCRIPTION: Specialty winding wire for transformers and coils that doesn't require interleaving insulation between layers.

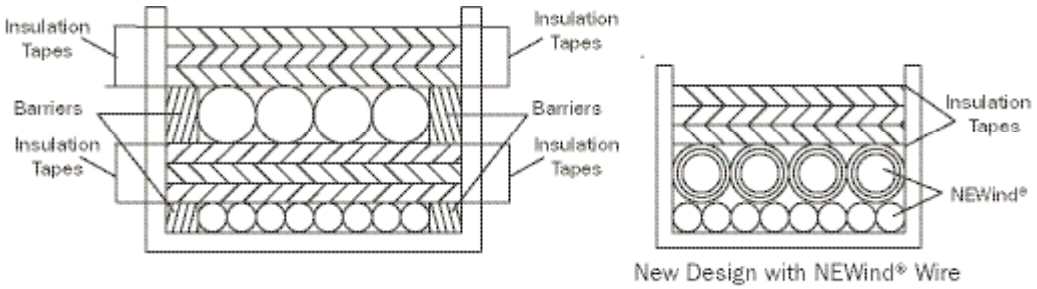
Conductor Material: Solid Copper
Insulatioin Thickness: .0015" min per Layer
Voltage Rating: Single Layer 600Vpk
Double & Triple Layer 1000 Vpk
Temperature Rating: UL/VDE Class F 155˚ C
Dielectric Strength: 1800 V/mil nominal

Single Layer:	UL 60950 Annex U	UL File E205791
Double Layer:	UL 60950 Annex U	UL File E205791
	IEC 60950 Annex U	VDE Reg. No. 135444
Triple Layer:	UL 60950 Annex U	UL File E205791
	IEC 60950 Annex U	VDE Reg. No. 135445

CONDUCTOR		DC RESISTANCE		SINGLE INSULATION			DOUBLE INSULATION			TRIPLE INSULATION		
AWG	O.D.	Bare Copper	Tinned Copper	PART NUMBER	O.D.	LBS/ 1000 FT	PART NUMBER	O.D.	LBS/ 1000 FT	PART NUMBER	O.D.	LBS/ 1000 FT
18	.0403	6.516	6.995	W18S1.5EXTC1A	.0433	5.064	W18D1.5EXXTC1A	.0463	5.217	W18T1.5EXXXTC1A	.0493	5.383
19	.0359	8.211	8.815	W19S1.5EXTC1A	.0389	4.023	W19D1.5EXXTC1A	.0419	4.171	W19T1.5EXXXTC1A	.0449	4.322
20	.0320	10.330	11.090	W20S1.5EXTC1A	.0350	3.216	W20D1.5EXXTC1A	.0380	3.343	W20T1.5EXXXTC1A	.0410	3.480
21	.0285	13.030	13.990	W21S1.5EXTC1A	.0315	2.563	W21D1.5EXXTC1A	.0345	2.677	W21T1.5EXXXTC1A	.0375	2.802
22	.0253	16.530	17.750	W22S1.5EXTC1A	.0283	2.031	W22D1.5EXXTC1A	.0313	2.134	W22T1.5EXXXTC1A	.0343	2.248
23	.0226	20.720	22.240	W23S1.5EXTC1A	.0256	1.630	W23D1.5EXXTC1A	.0286	1.724	W23T1.5EXXXTC1A	.0316	1.828
24	.0201	26.190	28.120	W24S1.5EXTC1A	.0231	1.298	W24D1.5EXXTC1A	.0261	1.383	W24T1.5EXXXTC1A	.0291	1.479
25	.0179	33.030	35.460	W25S1.5EXTC1A	.0209	1.037	W25D1.5EXXTC1A	.0239	1.115	W25T1.5EXXXTC1A	.0269	1.203
26	.0159	41.860	44.940	W26S1.5EXTC1A	.0189	.826	W26D1.5EXXTC1A	.0219	.897	W26T1.5EXXXTC1A	.0249	.978
27	.0142	52.480	56.340	W27S1.5EXTC1A	.0172	.665	W27D1.5EXXTC1A	.0202	.730	W27T1.5EXXXTC1A	.0232	.805
28	.0126	66.660	71.560	W28S1.5EXTC1A	.0156	.530	W28D1.5EXXTC1A	.0186	.589	W28T1.5EXXXTC1A	.0216	.659
29	.0113	82.880	88.970	W29S1.5EXTC1A	.0143	.431	W29D1.5EXXTC1A	.0173	.486	W29T1.5EXXXTC1A	.0203	.551
30	.0100	105.800	113.600	W30S1.5EXTC1A	.0130	.343	W30D1.5EXXTC1A	.0160	.393	W30T1.5EXXXTC1A	.0190	.454
31	.0089	133.900	143.800	W31S1.5EXTC1A	.0119	.276	W31D1.5EXXTC1A	.0149	.322	W31T1.5EXXXTC1A	.0179	.379
32	.0080	166.200	178.400	W32S1.5EXTC1A	.0110	.227	W32D1.5EXXTC1A	.0140	.270	W32T1.5EXXXTC1A	.0170	.324
33	.0071	211.700	228.200	W33S1.5EXTC1A	.0101	.182	W33D1.5EXXTC1A	.0131	.223	W33T1.5EXXXTC1A	.0161	.273
34	.0063	269.800	289.600	W34S1.5EXTC1A	.0093	.147	W34D1.5EXXTC1A	.0123	.185	W34T1.5EXXXTC1A	.0153	.233
35	.0056	342.800	368.100	W35S1.5EXTC1A	.0086	.120	W35D1.5EXXTC1A	.0116	.155	W35T1.5EXXXTC1A	.0146	.200
36	.0050	431.900	463.700	W36S1.5EXTC1A	.0080	.098	W36D1.5EXXTC1A	.0110	.131	W36T1.5EXXXTC1A	.0140	.175
37	.0045	535.700	575.100	W37S1.5EXTC1A	.0075	.082	W37D1.5EXXTC1A	.0105	.113	W37T1.5EXXXTC1A	.0135	.155
38	.0040	681.900	732.000	W38S1.5EXTC1A	.0070	.068	W38D1.5EXXTC1A	.0100	.097	W38T1.5EXXXTC1A	.0130	.137
39	.0035	897.100	963.100	W39S1.5EXTC1A	.0065	.054	W39D1.5EXXTC1A	.0095	.082	W39T1.5EXXXTC1A	.0125	.120
40	.0031	1152.000	1237.000	W40S1.5EXTC1A	.0061	.045	W40D1.5EXXTC1A	.0091	.071	W40T1.5EXXXTC1A	.0121	.108

NOTES:
1. Double and triple insulated conductors are included in UL approved Electrical Insulation System designated as NE-F1.
2. Conductor DC resistance is provided as maximum Ohms/1000 Ft @ 20˚C.
3. Our standard colors for these products include: clear, white, black, red, green, yellow, blue, brown, orange, gray and violet. Most are RoHS Compliant; please contact our design team to discuss your specific requirement.

Use of NEWind® Specialty Winding insulated conductors result in much smaller transformers due to decrease in number of winding wires required and removal of barrier tape and interleaved insulation tapes. Available in single layer of insulation, Supplementary (double layer) and Reinforced (triple layer) styles.



New Design with NEWind® Wire

USE: Telecommunication devices, laptop computers, digital cameras, games and other electronic devices such as electronic transformers, power adapters, switching mode power supply modules, battery chargers for mobile phones, motors and coils.

All measurements are in inches unless otherwise stated.

www.newenglandwire.com
Tel: 603.838.6624

NE-F1 Class F (155˚C) Electrical Insulation System

TECHNICAL INFORMATION

Electrical insulation systems are invaluable to coil and transformer designers as they eliminate the need for long term component testing. Combining the regulatory approvals of NE-F1 with the capabilities and experience of New England Wire Technologies at producing high performance winding wire products allows us to provide unique solutions to meet design challenges associated with today's winding needs.

NE-F1 Class F (155˚C) Electrical Insulation System was developed as a solution to cost, size and time saving issues. Extensive research and component testing allow us to provide a complete range of materials that are ideal for transformer, motor and coil designs leading to higher efficiency, smaller, lower cost devices that can be brought to market without longterm testing delays.

NE-F1 features NEWind™ Specialty Winding Wires which are designed to eliminate the need for separate ground, interwinding and turn insulation. This results in a smaller device that performs equivalent to, if not better than, the bulky and costlier larger devices.

NE-F1 also features a wide variety of bobbin materials, tapes, sleeving, potting compounds and varnishes. This diverse selection of material ensures that NE-F1 will be suitable for r the need for multiple Electrical Insulatio

INSULATION SYSTEM - MAJOR COMPONENTS

Magnet Wire (Winding Wire)

Category	Components
Polyester	MW30, MW35, MW73, MW74, MW76
Polyester (Solderable)	MW77, MW78
Polyurethane (Solderable)	MW79, MW80, MW82, MW83
NEWind® Winding Wire	ETFE, FEP, PFA

Ground and Interwinding Insulation

Supplier	Components
E.I. DuPont	Kapton HN
	Nomex 410, 414, 416, 418
	PTFE
	Rynite 530, FR530, FR530L, FR943
	Zenite 6130
Sumitomo Bakelite	E4008
	PM-9630
-	PET FILM

Varnishes

Supplier	Components
John C. Dolph	AC-43
	BC-346A, BC-346B, BC-346-4N, BC-346F
	BC359
	BC365
	CC-1105
Ripley Resin Engineering	468-2
Viking Products	V1380FC
	V1630FS

PRODUCT DETAILS

UL recognized for Class F (155˚ C) applications:
OBJS2 File E231977
Component IEC 60085
CAN/CSA C22.2 No. 0-M91, Appendix B
Approved for use in the construction of transformers, motors and coils.
Provides a large selection of major and minor component materials to support any application.