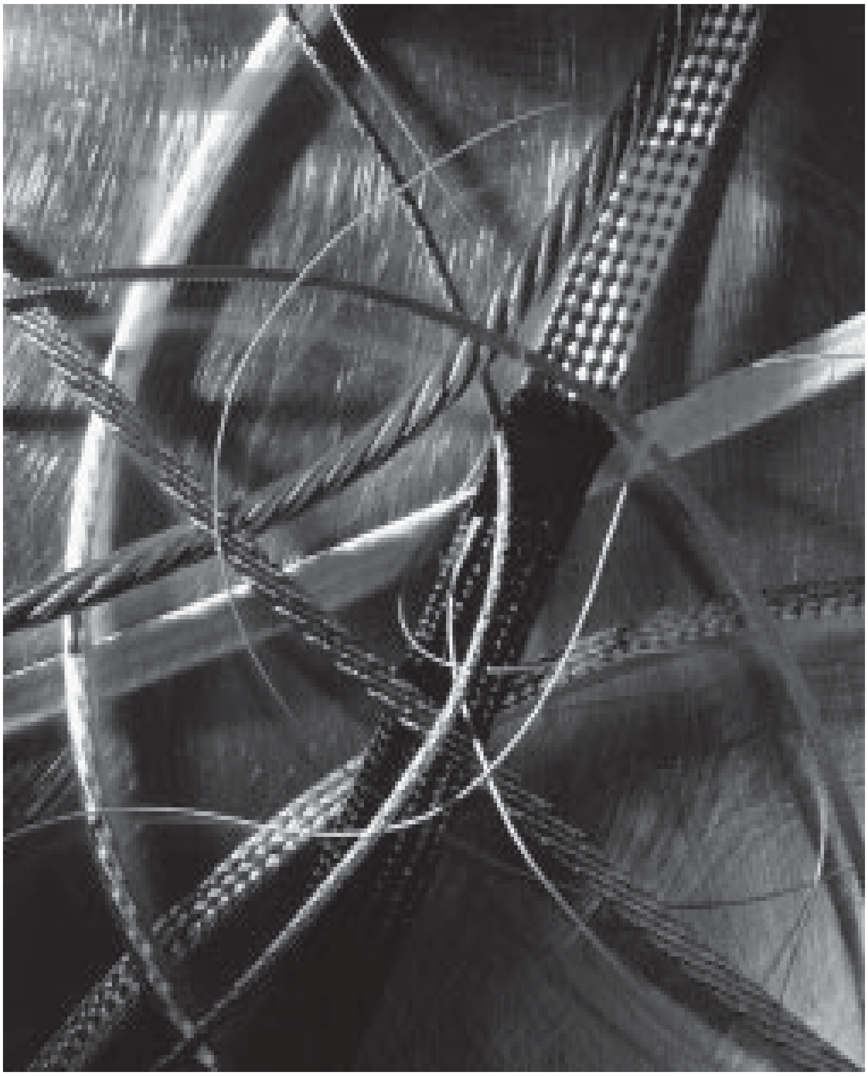
Litz Wire



Technical Information

NEW ENGLAND WIRE TECHNOLOGIES

Litz Wire

By definition, 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 below.

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 the following formula.

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	1152.30	1.0000
200 KHZ to 350 KHZ	42 AWG	.0025	1801.0	1.0000
350 KHZ to 850 KHZ	44 AWG	.0020	2873.0	1.0003
850 KHZ to 1.4 MHZ	46 AWG	.0016	4544.0	1.0003
1.4 MHZ 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]

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

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

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

[1] DuPont Registered Trademark
[2] See Radio Engineers Handbook - Terman, pp. 30 - 83.

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

Formula 3

$$R_{DC} = \frac{R_S\,(1.015)^{N_B}\,(1.025)^{N_C}}{N_S}$$

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 (NEEWC 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.

$$\frac{R_{AC}}{R_{DC}} = 1.0000 + 2\left(\frac{450 \text{ x } 0.0031}{0.094}\right)^2 \left(7.8x10^{-5}\right) = 1.0344$$

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 construction 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 type 3 Litz designs have greater current carrying capacities necesssary 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.

Round Litz

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Construction Type	Outer Insulation [2]	Nominal Outside Diameter (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 60 HZ to 1 KHZ										
24	476	3	28	S	1	—	.027	1.49	22.5	3/28
22	794	5	28	S	1	—	.035	2.48	13.5	5/28
20	1,112	7	28	S	1	—	.042	3.47	9.62	7/28
18	1,588	10	28	S	1	—	.050	5.02	6.74	10/28
16	2,700	17	28	S	1	SN	.065	8.69	3.96	17/28
14	4,129	26	28	S	1	SN	.080	13.3	2.59	26/28
12	6,670	42	28	S	1	SN	.102	21.3	1.60	42/28
10	10,480	66	28	S	2	SN	.140	34.5	1.05	3x22/28
8	16,674	105	28	S	2	SN	.177	54.9	.657	3x35/28
6	26,202	165	28	S	2	SN	.222	86.2	.418	5x33/28
4	42,240	266	28	S	2	DN	.285	141.	.259	7x38/28
2	66,696	420	28	S	2	DN	.431	228.	.168	5x3x28/28
1/0	105,602	665	28	S	2	SNB	.537	366.	.106	7x5x19/28
2/0	133,392	840	28	S	5	SNB	.657	480.	.084	6(5x28/28)
3/0	171,504	1,080	28	S	5	SNB	.787	634.	.065	9(5x24/28)
4/0	217,238	1,368	28	S	5	SNB	.941	828.	.051	12(3x38/28)
Recommended Operating Frequency — 1 KHZ to 10 KHZ										
26	300	3	30	S	1	—	.022	.95	35.8	3/30
24	500	5	30	S	1	—	.028	1.58	21.5	5/30
22	700	7	30	S	1	—	.033	2.22	15.4	7/30
20	1,100	11	30	S	1	—	.045	3.58	9.76	11/30
18	1,700	17	30	S	1	SN	.055	5.50	6.32	17/30
16	2,600	26	30	S	1	SN	.064	8.38	4.13	26/30
14	4,200	42	30	S	1	SN	.082	13.5	2.56	42/30
12	6,500	65	30	S	2	SN	.112	21.4	1.69	5x13/30
10	11,000	110	30	S	2	SN	.145	36.3	1.00	5x22/30
8	16,800	168	30	H	2	—	.191	54.6	.655	7x24/30
7	25,900	259	30	H	2	—	.237	84.1	.425	7x37/30
6	26,600	266	30	H	2	—	.240	86.4	.413	7X38/30
4	41,300	413	30	H	2	—	.300	134.	.266	7x59/30
3	52,500	525	30	H	2	—	.338	171.	.209	7x75/30
2	66,500	665	30	H	2	—	.380	216.	.165	7x95/30
2	80,500	805	30	H	2	DN	.421	267.	.136	7x115/30
1/0	125,000	1,250	30	S	2	SNB	.631	435.	.090	5x5x50/30
2/0	135,000	1,350	30	S	5	SNB	.667	486.	.083	6(5x45/30)
3/0	195,000	1,950	30	S	5	SNB	.794	697.	.057	6(5x5x13/30)
4/0	252,000	2,520	30	S	5	SNB	.981	916.	.045	6(5x3x28/30)

1 & 2 See page 8

Round Litz

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Construction Type	Outer Insulation [2]	Nominal Outside Diameter (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 10 KHZ to 20 KHZ										
26	303	6	33	S	1	SN	.025	1.01	35.8	6/33
24	403	8	33	S	1	—	.025	1.27	26.9	8/33
22	655	13	33	S	1	SN	.035	2.15	16.6	13/33
20	1,059	21	33	S	1	SN	.044	3.44	10.3	21/33
18	1,613	32	33	S	1	SN	.054	5.22	6.71	32/33
16	2,672	53	33	S	1	SN	.066	8.60	4.05	53/33
14	5,041	100	33	S	2	SN	.099	16.6	2.20	5x20/33
12	7,562	150	33	S	2	SN	.121	24.9	1.47	5x30/33
10	10,586	210	33	S	2	SN	.144	34.8	1.05	3x70/33
8	16,585	329	33	S	2	DN	.183	55.4	.669	7x47/33
6	26,465	525	33	S	2	DN	.230	90.4	.430	5x3x35/33
4	42,849	850	33	S	2	DN	.292	146.	.265	5x5x34/33
2	66,541	1,320	33	S	5	SNB	.484	244.	.171	6(5x44/33)
1	90,738	1,800	33	S	5	SNB	.558	334.	.127	6(3/5/20/33)
1/0	105,861	2,100	33	S	5	SNB	.600	383.	.107	6(5/70/33)
2/0	136,107	2,700	33	S	5	SNB	.675	496.	.084	6(5x3/30/33)
3/0	169,377	3,360	33	S	5	SNB	.850	651.	.067	12(5x56/33)
4/0	211,772	4,200	33	S	5	SNB	.987	841.	.054	14(5x3/20/33)
—	299,435	5,940	33	S	6	PVC	1.29	1255.	.038	6(6(5/33/33))
—	512,972	10,176	33	S	6	PVC	1.80	2283.	.022	8(6(4x53/33))
—	725,904	14,400	33	S	6	PVC	2.42	3550.	.016	15(6(5x32/33))
—	917,462	18,200	33	S	6	PVC	3.12	5088.	.012	20(13(70/33))
—	1,572,792	31,200	33	S	6	PVC	3.99	8684.	.007	20(6(5/52/33))
Recommended Operating Frequency — 20 KHZ to 50 KHZ										
30	100	4	36	S	1	—	.013	.319	109.6	4/36
28	175	7	36	S	1	—	.017	.559	62.7	7/36
26	250	10	36	S	1	SN	.024	.846	43.9	10/36
24	400	16	36	S	1	SN	.029	1.34	27.4	16/36
22	675	27	36	S	1	SN	.037	2.24	16.3	27/36
20	1,025	41	36	S	1	SN	.045	3.37	10.7	41/36
18	1,625	65	36	S	2	SN	.061	5.46	6.91	5x13/36
16	2,625	105	36	S	2	SN	.073	8.78	4.26	3x35/36
14	4,125	165	36	S	2	SN	.091	13.8	2.72	5x33/36
12	6,625	265	36	S	2	SN	.116	22.1	1.70	5x53/36
10	10,500	420	36	S	2	DN	.149	36.4	1.10	5x3x28/36
8	16,500	660	36	S	2	DN	.186	57.2	.697	5x3x44/36
6	26,250	1,050	36	S	2	DN	.234	90.7	.438	5x5x42/36
4	45,000	1,800	36	S	2	DN	.305	155.	.255	5x5x72/36
2	66,500	2,660	36	S	2	DN	.370	228.	.173	7x5x76/36
1	84,000	3,360	36	S	5	SNB	.548	318.	.140	6(5x4x28/36)
1/0	108,000	4,320	36	S	5	SNB	.655	420.	.109	9(5x3x32/36)
2/0	135,000	5,400	36	S	5	SNB	.728	522.	.087	9(5x3x40/36)
3/0	171,000	6,840	36	S	5	SNB	.870	682.	.069	12(5x3x38/36)
4/0	211,500	8,460	36	S	5	SNB	.962	840.	.055	12(5x3x47/36)

[1 & 2] See page 8

Round Litz

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Construction Type	Outer Insulation [2]	Nominal Outside Diameter (inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 50 KHZ to 100 KHZ										
30	112	7	38	S	1	SN	.017	.382	98.9	7/38
28	160	10	38	S	1	SN	.020	.538	69.3	10/38
26	256	16	38	S	1	SN	.024	.849	43.3	16/38
24	400	25	38	S	1	SN	.029	1.31	27.7	25/38
22	640	40	38	S	1	SN	.036	2.08	17.4	40/38
20	1,056	66	38	S	1	SN	.050	3.50	10.8	3/22/38
18	1,600	100	38	S	2	SN	.061	5.27	7.10	5x20/38
16	2,592	162	38	S	2	SN	.073	8.50	4.38	3/54/38
14	4,160	260	38	S	2	SN	.093	13.6	2.73	5x52/38
12	6,720	420	38	S	2	SN	.118	22.5	1.73	5x3/28/38
10	10,560	660	38	S	2	DN	.150	35.9	1.11	5x3/44/38
8	16,800	1,050	38	S	2	DN	.189	57.0	.692	5x5x42/38
6	26,400	1,650	38	S	2	DN	.236	89.4	.440	5x5x66/38
4	42,000	2,625	38	S	2	DN	.296	146.	.283	5x5x3/35/38
2	66,240	4,140	38	S	5	SNB	.494	247.	.180	6(5x3/46/38)
1	84,000	5,250	38	S	5	SNB	.551	311.	.141	6(5x5x35/38)
1/0	105,600	6,600	38	S	5	SNB	.613	389.	.112	6(5x5x44/38)
2/0	136,000	8,500	38	S	5	SNB	.749	522.	.087	10(5x5x34/38)
3/0	168,000	10,500	38	S	5	SNB	.828	642.	.070	10(5x5x42/38)
4/0	211,200	13,200	38	S	5	SNB	.966	824.	.056	12(5x5x44/38)
Recommended Operating Frequency — 100 KHZ to 200 KHZ										
34	38.4	4	40	S	1	—	.008	.127	292.4	4/40
32	67.3	7	40	S	1	—	.011	.222	167.1	7/40
30	106.	11	40	S	1	SN	.017	.380	106.3	11/40
28	163.	17	40	S	1	SN	.020	.578	68.8	17/40
26	260.	27	40	S	1	SN	.024	.905	43.3	27/40
24	404	42	40	S	1	SN	.030	1.40	27.9	42/40
22	634.	66	40	S	2	SN	.040	2.23	18.2	3x22/40
20	1,036.	108	40	S	2	SN	.050	3.62	11.1	3/36/40
18	1,634.	170	40	S	2	SN	.061	5.67	7.05	5/34/40
16	2,595.	270	40	S	2	SN	.073	9.18	4.55	3/3/30/40
14	4,180.	435	40	S	2	SN	.093	14.8	2.83	5x3/29/40
12	6,727.	700	40	S	2	SN	.118	23.7	1.76	5x5x28/40
10	10,571.	1,100	40	S	2	SN	.148	37.3	1.12	5x5x44/40
8	17,298.	1,800	40	S	5	DN	.236	66.6	.700	6(5x3/20/40)
6	26,812.	2,790	40	S	5	DN	.293	103.	.451	6(5x3/31/40)
4	42,813.	4,455	40	S	5	SNB	.431	176.	.282	9(5x3/33/40)
2	69,192.	7,200	40	S	5	SNB	.572	290.	.174	12(5x3/40/40)
1/0	105,710.	11,000	40	S	5	SNB	.668	428.	.114	10(5x5x44/40)

[1 & 2] See page 8

Round Litz

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Construction Type	Outer Insulation [2]	Nominal Outside Diameter (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 200 KHZ to 350 KHZ										
36	25.0	4	42	S	1	—	.007	.079	457.0	4/42
34	43.8	7	42	S	1	SN	.012	.157	261.2	7/42
32	62.5	10	42	S	1	SN	.014	.220	182.8	10/42
30	100.	16	42	S	1	SN	.016	.345	114.3	16/42
28	163.	26	42	S	1	SN	.020	.551	70.3	26/42
26	250.	40	42	S	1	SN	.024	.836	45.7	40/42
24	413.	66	42	S	2	SN	.031	1.40	28.4	3/22/42
22	656.	105	42	S	2	SN	.040	2.21	17.8	5/21/42
20	1,031.	165	42	S	2	SN	.049	3.45	11.4	5/33/42
18	1,688.	270	42	S	2	SN	.062	5.74	7.11	5x3/18/42
16	2,625.	420	42	S	2	SN	.073	8.88	4.57	5x3/28/42
14	4,125.	660	42	S	2	SN	.092	13.9	2.91	5x3/44/42
12	6,563.	1,050	42	S	2	DN	.119	22.4	1.83	5x5x42/42
10	10,687.	1,710	42	S	5	DN	.185	40.3	1.15	6(5x3/19/42)
8	16,875.	2,700	42	S	5	DN	.231	63.0	.729	6(5x3/30/42)
6	26,250.	4,200	42	S	5	DN	.287	97.1	.468	6(5x5/28/42)
4	42,188.	6,750	42	S	5	SNB	.434	169.	.291	10(5x3/45/42)
2	67,500.	10,800	42	S	5	SNB	.561	272.	.182	12(5x5/36/42)
Recommended Operating Frequency — 350 KHZ to 850 KHZ										
38	16	4	44	S	1	—	.005	.050	729.1	4/44
36	28	7	44	S	1	SN	.010	.102	416.6	7/44
34	40	10	44	S	1	SN	.011	.143	291.7	10/44
32	64	16	44	S	1	SN	.014	.223	182.3	16/44
30	100	25	44	S	1	SN	.016	.341	116.7	25/44
28	160	40	44	S	1	SN	.019	.537	72.9	40/44
26	264	66	44	S	2	SN	.026	.898	45.3	3/22/44
24	420	105	44	S	2	SN	.032	1.41	28.5	3/35/44
22	640	160	44	S	2	SN	.039	2.13	18.7	5/32/44
20	1,020	255	44	S	2	SN	.048	3.37	11.7	5/51/44
18	1,620	405	44	S	2	SN	.060	5.45	7.56	5x3/27/44
16	2,600	650	44	S	2	SN	.072	8.71	4.72	5x5/26/44
14	4,200	1,050	44	S	2	SN	.091	14.0	2.920	5x5x42/44
12	6,600	1,650	44	S	2	DN	.117	22.8	1.910	5x5x3/22/44
10	10,500	2,625	44	S	2	DN	.146	36.4	1.200	5x5x3/35/44
8	16,800	4,200	44	S	5	DN	.226	62.0	.747	6(5x5/28/44)

[1 & 2] See page 8

Round Litz

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Construction Type	Outer Insulation [2]	Nominal Outside Diameter (inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 850 KHZ to 1.4 MHZ										
38	17.3	7	46	S	1	—	.006	.054	658.9	7/46
36	24.7	10	46	S	1	SN	.010	.092	461.2	10/46
34	39.5	16	46	S	1	SN	.011	.142	288.3	16/46
32	64.2	26	46	S	1	SN	.014	.225	177.4	26/46
30	101.	41	46	S	1	SN	.016	.348	112.5	41/46
28	163.	66	46	S	2	SN	.021	.567	71.6	3/22/46
26	259.	105	46	S	2	SN	.026	.889	45.1	3/35/46
24	408.	165	46	S	2	SN	.032	1.38	28.7	5/33/46
22	667.	270	46	S	2	SN	.039	2.29	18.0	3x3/30/46
20	1,038.	420	46	S	2	SN	.048	3.54	11.6	5x3/28/46
18	1,630.	660	46	S	2	SN	.060	5.53	7.34	5x3/44/46
16	2,593.	1,050	46	S	2	SN	.072	8.75	4.61	5x5/42/46
14	4,261.	1,725	46	S	2	DN	.095	14.9	2.88	5x5x3/23/46
12	6,669.	2,700	46	S	2	DN	.118	23.2	1.84	5x5x3/36/46
10	10,745.	4,350	46	S	5	DN	.191	40.5	1.14	6(5x5/29/46)
Recommended Operating Frequency — 1.4 MHZ to 2.8 MHZ										
42	7.7	5	48	S	1	—	.004	.024	1478.9	5/48
40	10.8	7	48	S	1	SN	.008	.044	1056.3	7/48
38	18.5	12	48	S	1	SN	.009	.072	616.2	12/48
36	27.7	18	48	S	1	SN	.010	.104	410.8	18/48
34	40.0	26	48	S	1	SN	.012	.147	284.4	26/48
32	69.3	45	48	S	1	SN	.014	.247	164.3	45/48
30	102.	66	48	S	2	SN	.018	.367	114.8	3/22/48
28	162.	105	48	S	2	SN	.022	.573	72.2	5/21/48
26	277.	180	48	S	2	SN	.027	.966	42.1	5x36/48
24	462.	300	48	S	2	SN	.034	1.63	25.9	5/3/20/48
22	647.	420	48	S	2	SN	.040	2.26	18.5	5/3/28/48
20	1,040.	675	48	S	2	SN	.050	3.61	11.5	5x3/45/48
18	1,694.	1,100	48	S	2	SN	.062	5.85	7.06	5x5/44/48
16	2,657.	1,725	48	S	2	SN	.074	9.35	4.62	5x5/3/23/48
14	4,158.	2,700	48	S	2	SN	.093	14.6	2.95	5x5/3/36/48
12	6,930.	4,500	48	S	5	DN	.159	26.9	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
DNB = double nylon braid
PVC = extruded polyvinylchloride

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 for custom applications.

Rectangular Braided Litz

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Construction
Recommended Operating Frequency — 1 KHZ to 15 KHZ								
10	9,600	96	30	H	.363	.073	33	24-4-30
9	12,000	120	30	H	.435	.073	41	24-5-30
8	16,800	168	30	H	.508	.073	58	24-7-30
6	24,000	240	30	H	.580	.109	83	24-10-30
5	36,000	360	30	H	.725	.109	124	24-15-30
5	33,600	336	30	H	1.60	.073	121	48-7-30
4	48,000	480	30	H	.870	.145	173	24-20-30
3	64,800	648	30	H	1.09	.145	227	24-27-30
2	76,800	768	30	H	1.16	.145	279	24-32-30
1/0	105,600	1,056	30	H	1.45	.145	373	24-44-30
2/0	153,600	1,536	30	H	2.32	.181	526	48-32-30
3/0	168,000	1,680	30	H	2.61	.181	569	48-35-30
4/0	249,600	2,496	30	H	2.90	.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	1,600	64	36	H	.113	.038	5.41	16-4-36
16	2,400	96	36	H	.188	.038	8.50	24-4-36
14	4,200	168	36	H	.263	.038	15.	24-7-36
11	7,200	288	36	H	.450	.038	26.	48-6-36
10	9,600	384	36	H	.450	.076	33.	24-16-36
9	13,200	528	36	H	.750	.056	46.	48-11-36
8	18,000	720	36	H	.750	.075	63.	48-15-36
6	26,400	1,056	36	H	1.05	.075	96.	48-22-36
4	40,200	1,608	36	H	.90	.113	143.	24-67-36
2	72,000	2,880	36	H	1.50	.113	265.	48-60-36
1/0	100,800	4,032	36	H	1.95	.150	376.	48-84-36

[1] H = heavy-film coating

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 has pioneered the development of type 8 Litz design including square configurations as well as the rectangular constructions listed. Please consult our Engineering Department for the type 8 designs requiring specific wire sizes or dimensions.

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 400 HZ to 5 KHZ **The following designs utilize monolithic conductors for the base group.**									
4	46,403	7	12	H	.327	.152	140	.262	7x12
3	53,032	8	12	H	.374	.152	160	.229	8x12
3	59,661	9	12	H	.421	.152	180	.204	9x12
2	66,290	10	12	H	.468	.152	200	.184	10x12
2	72,919	11	12	H	.515	.152	220	.167	11x12
2	79,548	12	12	H	.533	.152	240	.153	12x12
1	86,177	13	12	H	.575	.152	260	.141	13x12
1	92,806	14	12	H	.619	.152	280	.131	14x12
1	99,435	15	12	H	.661	.152	300	.122	15x12
1/0	106,064	16	12	H	.704	.152	320	.115	16x12
1/0	112,693	17	12	H	.747	.152	341	.108	17x12
1/0	119,322	18	12	H	.789	.152	361	.102	18x12
6	28,763	7	14	H	.262	.121	88	.416	7x14
5	32,872	8	14	H	.299	.121	101	.364	8x14
5	36,981	9	14	H	.337	.121	113	.324	9x14
4	41,090	10	14	H	.374	.121	126	.291	10x14
4	45,199	11	14	H	.392	.121	138	.265	11x14
4	49,308	12	14	H	.426	.121	151	.243	12x14
3	53,417	13	14	H	.460	.121	163	.224	13x14
3	57,526	14	14	H	.495	.121	176	.208	14x14
3	61,635	15	14	H	.528	.121	189	.194	15x14
2	65,744	16	14	H	.563	.121	201	.182	16x14
2	69,853	17	14	H	.597	.121	214	.171	17x14
2	73,962	18	14	H	.631	.121	226	.162	18x14
2	78,071	19	14	H	.666	.121	239	.153	19x14
1	82,180	20	14	H	.700	.121	251	.146	20x14
1	86,289	21	14	H	.735	.121	264	.139	21x14
1	90,398	22	14	H	.769	.121	277	.132	22x14
1	94,507	23	14	H	.802	.121	289	.127	23x14
1	98,616	24	14	H	.837	.121	302	.121	24x14

[1] H = heavy-film coating

*New England U.S. Patent 4439256

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 400 HZ to 5 KHZ									
The following designs utilize monolithic conductors for the base group.									
7	18,067	7	16	H	.210	.097	55.7	.663	7x16
7	20,648	8	16	H	.240	.097	63.6	.581	8x16
7	23,229	9	16	H	.270	.097	71.6	.516	9x16
6	25,810	10	16	H	.299	.097	79.5	.464	10x16
6	28,391	11	16	H	.329	.097	87.5	.422	11x16
6	30,972	12	16	H	.341	.097	95.4	.387	12x16
5	33,553	13	16	H	.368	.097	103.	.357	13x16
5	36,134	14	16	H	.396	.097	111.	.332	14x16
5	38,715	15	16	H	.423	.097	119.	.310	15x16
4	41,296	16	16	H	.451	.097	127.	.290	16x16
4	43,877	17	16	H	.478	.097	135.	.273	17x16
4	46,458	18	16	H	.506	.097	143.	.258	18x16
4	49,039	19	16	H	.534	.097	151.	.244	19x16
3	51,620	20	16	H	.561	.097	159.	.232	20x16
3	54,201	21	16	H	.588	.097	167.	.221	21x16
3	56,782	22	16	H	.616	.097	175.	.211	22x16
3	59,363	23	16	H	.643	.097	183.	.202	23x16
3	61,944	24	16	H	.671	.097	191.	.194	24x16
10	11,368	7	18	H	.168	.078	35.1	1.054	7x18
9	12,992	8	18	H	.192	.078	40.2	.923	8x18
9	14,616	9	18	H	.216	.078	45.2	.820	9x18
8	16,240	10	18	H	.240	.078	50.2	.738	10x18
8	17,864	11	18	H	.252	.078	55.2	.671	11x18
8	19,488	12	18	H	.273	.078	60.2	.615	12x18
7	21,112	13	18	H	.295	.078	65.3	.568	13x18
7	22,736	14	18	H	.317	.078	70.3	.527	14x18
7	24,360	15	18	H	.339	.078	75.3	.492	15x18
6	25,984	16	18	H	.361	.078	80.3	.461	16x18
6	27,608	17	18	H	.383	.078	85.3	.434	17x18
6	29,232	18	18	H	.405	.078	90.4	.410	18x18
6	30,856	19	18	H	.428	.078	95.4	.388	19x18
5	32,480	20	18	H	.449	.078	100.	.369	20x18
5	34,104	21	18	H	.472	.078	105.	.351	21x18
5	35,728	22	18	H	.493	.078	110.	.335	22x18
5	37,352	23	18	H	.500	.078	115.	.321	23x18
5	38,976	24	18	H	.538	.078	120.	.308	24x18

[1] H = heavy-film coating

*New England U.S. Patent 4439256

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 400 HZ to 5 KHZ									
The following designs utilize monolithic conductors for the base group.									
12	7,168	7	20	H	.132	.062	22.1	1.67	7x20
11	8,192	8	20	H	.149	.062	25.3	1.46	8x20
11	9,216	9	20	H	.167	.062	28.4	1.30	9x20
10	10,240	10	20	H	.184	.062	31.6	1.17	10x20
10	11,264	11	20	H	.201	.062	34.8	1.06	11x20
10	12,288	12	20	H	.219	.062	37.9	.974	12x20
9	13,312	13	20	H	.236	.062	41.1	.899	13x20
9	14,336	14	20	H	.254	.062	44.2	.835	14x20
9	15,360	15	20	H	.272	.062	47.4	.779	15x20
8	16,384	16	20	H	.289	.062	50.6	.731	16x20
8	17,408	17	20	H	.307	.062	53.7	.688	17x20
8	18,432	18	20	H	.325	.062	56.9	.650	18x20
8	19,456	19	20	H	.342	.062	60.0	.615	19x20
7	20,480	20	20	H	.360	.062	63.2	.585	20x20
7	21,504	21	20	H	.378	.062	66.4	.557	21x20
7	22,528	22	20	H	.395	.062	69.5	.531	22x20
7	23,552	23	20	H	.413	.062	72.7	.508	23x20
7	24,576	24	20	H	.431	.062	75.8	.487	24x20
14	4,480	7	22	H	.108	.050	13.9	2.69	7x22
13	5,120	8	22	H	.120	.050	15.9	2.35	8x22
13	5,760	9	22	H	.133	.050	17.9	2.09	9x22
12	6,401	10	22	H	.147	.050	19.9	1.88	10x22
12	7,041	11	22	H	.161	.050	21.9	1.71	11x22
12	7,681	12	22	H	.175	.050	23.9	1.57	12x22
11	8,321	13	22	H	.189	.050	25.9	1.45	13x22
11	8,961	14	22	H	.204	.050	27.9	1.34	14x22
11	9,601	15	22	H	.218	.050	29.9	1.25	15x22
10	10,241	16	22	H	.232	.050	31.8	1.18	16x22
10	10,881	17	22	H	.246	.050	33.8	1.11	17x22
15	3,636	9	24	H	.105	.038	11.3	3.30	9x24
14	4,040	10	24	H	.116	.038	12.6	2.97	10x24
14	4,444	11	24	H	.129	.038	13.9	2.70	11x24
14	4,848	12	24	H	.140	.038	15.1	2.47	12x24
13	5,252	13	24	H	.152	.038	16.4	2.28	13x24
13	5,656	14	24	H	.163	.038	17.6	2.12	14x24
13	6,060	15	24	H	.176	.038	18.9	1.98	15x24
12	6,464	16	24	H	.187	.038	20.2	1.86	16x24
12	6,868	17	24	H	.199	.038	21.4	1.75	17x24

[1] H = heavy-film coating

*New England U.S. Patent 4439256

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 60 HZ to 1 KHZ									
The following designs utilize 7 strand concentric conductors for the base group.									
2	79,576	49	18	H	.495	.233	250	.153	7x7x18
1	90,944	56	18	H	.559	.233	285	.134	8x7x18
1	102,312	63	18	H	.624	.233	321	.119	9x7x18
1/0	113,680	70	18	H	.689	.233	357	.107	10x7x18
1/0	125,048	77	18	H	.755	.233	392	.097	11x7x18
2/0	136,416	84	18	H	.820	.233	428	.089	12x7x18
4	50,176	49	20	H	.396	.187	157	.242	7x7x20
3	57,344	56	20	H	.448	.187	180	.212	8x7x20
3	64,512	63	20	H	.500	.187	202	.188	9x7x20
2	71,680	70	20	H	.552	.187	225	.170	10x7x20
2	78,848	77	20	H	.604	.187	247	.154	11x7x20
1	86,016	84	20	H	.657	.187	269	.141	12x7x20
1	93,184	91	20	H	.709	.187	292	.130	13x7x20
1	100,352	98	20	H	.768	.187	314	.121	14x7x20
1/0	107,520	105	20	H	.815	.187	337	.113	15x7x20
1/0	114,688	112	20	H	.868	.187	359	.106	16x7x20
6	31,368	49	22	H	.317	.150	99	.389	7x7x22
5	35,848	56	22	H	.359	.150	113	.341	8x7x22
5	40,329	63	22	H	.400	.150	127	.303	9x7x22
4	44,810	70	22	H	.442	.150	141	.273	10x7x22
4	49,291	77	22	H	.484	.150	156	.248	11x7x22
3	53,772	84	22	H	.526	.150	170	.227	12x7x22
3	58,253	91	22	H	.568	.150	184	.210	13x7x22
3	62,734	98	22	H	.611	.150	198	.195	14x7x22
2	67,215	105	22	H	.653	.150	212	.182	15x7x22
2	71,696	112	22	H	.695	.150	226	.170	16x7x22
2	76,177	119	22	H	.738	.150	240	.160	17x7x22
2	80,658	126	22	H	.780	.150	255	.151	18x7x22
1	85,139	133	22	H	.823	.150	269	.143	19x7x22
1	89,614	140	22	H	.864	.150	283	.136	20x7x22

[1] H = heavy-film coating

*New England U.S. Patent 4439256

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 60 HZ to 1 KHZ									
The following designs utilize 7 strand concentric conductors for the base group.									
8	19,796	49	24	H	.257	.121	62.7	.615	7x7x24
7	22,624	56	24	H	.290	.121	71.6	.538	8x7x24
7	25,452	63	24	H	.324	.121	80.6	.478	9x7x24
6	28,280	70	24	H	.357	.121	89.5	.430	10x7x24
6	31,108	77	24	H	.391	.121	98.5	.391	11x7x24
5	33,936	84	24	H	.425	.121	107.	.359	12x7x24
5	36,764	91	24	H	.459	.121	116.	.331	13x7x24
5	39,592	98	24	H	.494	.121	125.	.307	14x7x24
4	42,420	105	24	H	.528	.121	134.	.287	15x7x24
4	45,248	112	24	H	.562	.121	143.	.269	16x7x24
4	48,076	119	24	H	.596	.121	152.	.253	17x7x24
4	50,904	126	24	H	.630	.121	161.	.239	18x7x24
3	53,732	133	24	H	.665	.121	170.	.226	19x7x24
3	56,560	140	24	H	.699	.121	179.	.215	20x7x24
3	59,388	147	24	H	.734	.121	187.	.205	21x7x24
3	62,216	154	24	H	.767	.121	197.	.196	22x7x24
2	65,044	161	24	H	.801	.121	206.	.187	23x7x24
2	67,872	168	24	H	.836	.121	215.	.179	24x7x24
10	12,390	49	26	H	.206	.097	39.7	.987	7x7x26
9	14,160	56	26	H	.233	.097	45.4	.864	8x7x26
9	15,930	63	26	H	.260	.097	51.1	.768	9x7x26
8	17,700	70	26	H	.287	.097	56.8	.691	10x7x26
8	19,470	77	26	H	.314	.097	62.4	.628	11x7x26
7	21,240	84	26	H	.342	.097	68.1	.576	12x7x26
7	23,010	91	26	H	.369	.097	73.8	.532	13x7x26
7	24,780	98	26	H	.397	.097	79.5	.494	14x7x26
6	26,550	105	26	H	.424	.097	85.2	.461	15x7x26
6	28,320	112	26	H	.452	.097	90.8	.432	16x7x26
6	30,090	119	26	H	.479	.097	96.5	.407	17x7x26
6	31,860	126	26	H	.507	.097	102.	.384	18x7x26
5	33,630	133	26	H	.534	.097	108.	.364	19x7x26
5	35,400	140	26	H	.562	.097	114.	.346	20x7x26
5	37,170	147	26	H	.590	.097	119.	.329	21x7x26
5	38,940	154	26	H	.617	.097	125.	.314	22x7x26
5	40,710	161	26	H	.644	.097	131.	.300	23x7x26
4	42,480	168	26	H	.672	.097	136.	.288	24x7x26

[1] H = heavy-film coating

*New England U.S. Patent 4439256

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 60 HZ to 10 KHZ									
The following designs utilize 7 strand concentric conductors for the base group.									
12	7,784	49	28	H	.151	.078	25.1	1.56	7x7x28
11	8,896	56	28	H	.173	.078	28.6	1.36	8x7x28
11	10,008	63	28	H	.194	.078	32.2	1.21	9x7x28
10	11,120	70	28	H	.216	.078	35.8	1.09	10x7x28
10	12,232	77	28	H	.238	.078	39.4	.991	11x7x28
9	13,344	84	28	H	.259	.078	43.0	.909	12x7x28
9	14,456	91	28	H	.281	.078	46.6	.839	13x7x28
9	15,568	98	28	H	.302	.078	50.1	.779	14x7x28
8	16,680	105	28	H	.324	.078	53.7	.727	15x7x28
8	17,792	112	28	H	.346	.078	57.3	.681	16x7x28
8	18,904	119	28	H	.367	.078	60.9	.641	17x7x28
8	20,016	126	28	H	.389	.078	64.5	.606	18x7x28
7	21,128	133	28	H	.410	.078	68.0	.574	19x7x28
7	22,240	140	28	H	.432	.078	71.6	.545	20x7x28
7	23,352	147	28	H	.453	.078	75.2	.519	21x7x28
7	24,464	154	28	H	.475	.078	78.8	.496	22x7x28
7	25,576	161	28	H	.497	.078	82.4	.474	23x7x28
14	4,900	49	30	H	.122	.063	15.8	2.48	7x7x30
13	5,600	56	30	H	.139	.063	18.1	2.17	8x7x30
13	6,300	63	30	H	.157	.063	20.3	1.93	9x7x30
12	7,000	70	30	H	.174	.063	22.6	1.74	10x7x30
12	7,700	77	30	H	.191	.063	24.9	1.58	11x7x30
11	8,400	84	30	H	.209	.063	27.1	1.45	12x7x30
11	9,100	91	30	H	.226	.063	29.4	1.34	13x7x30
11	9,800	98	30	H	.244	.063	31.6	1.24	14x7x30
10	10,500	105	30	H	.261	.063	33.9	1.14	15x7x30
10	11,200	112	30	H	.278	.063	36.2	1.09	16x7x30
10	11,900	119	30	H	.296	.063	38.4	1.02	17x7x30

[1] H = heavy-film coating

*New England U.S. Patent 4439256

Rectangular Compacted Litz*

Equivalent Gauge	Circular Mil Area	Number of Strands	Strand Gauge	Film Coating [1]	Nominal Width (Inches)	Nominal Thickness (Inches)	Nominal LBS./MFT.	Direct Current Resistance OHMS/MFT.	Construction
Recommended Operating Frequency — 10 KHZ to 50 KHZ									
The following designs utilize 7 strand concentric and bonded* conductors for the base group.									
17	2,470	49	33	H	.082	.045	8.0	4.97	7x7x33
16	2,822	56	33	H	.094	.045	9.2	4.35	8x7x33
16	3,176	63	33	H	.106	.045	10.3	3.86	9x7x33
15	3,529	70	33	H	.118	.045	11.4	3.47	10x7x33
15	3,882	77	33	H	.129	.045	12.6	3.16	11x7x33
14	4,234	84	33	H	.141	.045	13.7	2.90	12x7x33
14	4,587	91	33	H	.153	.045	14.9	2.68	13x7x33
14	4,940	98	33	H	.165	.045	16.0	2.48	14x7x33
13	5,293	105	33	H	.177	.045	17.2	2.32	15x7x33
13	5,646	112	33	H	.188	.045	18.3	2.17	16x7x33
13	5,999	119	33	H	.200	.045	19.5	2.05	17x7x33
20	1,225	49	36	H	.058	.032	4.0	10.14	7x7x36
19	1,400	56	36	H	.066	.032	4.6	8.87	8x7x36
19	1,575	63	36	H	.074	.032	5.1	7.88	9x7x36
18	1,750	70	36	H	.082	.032	5.7	7.10	10x7x36
18	1,925	77	36	H	.091	.032	6.3	6.28	11x7x36
17	2,100	84	36	H	.099	.032	6.8	5.91	12x7x36
17	2,275	91	36	H	.107	.032	7.4	5.46	13x7x36
17	2,450	98	36	H	.115	.032	8.0	5.07	14x7x36
16	2,625	105	36	H	.124	.032	8.6	4.73	15x7x36
16	2,800	112	36	H	.132	.032	9.1	4.43	16x7x36
16	2,975	119	36	H	.140	.032	9.7	4.17	17x7x36

[1] H = heavy-film coating
*New England U.S. Patent 4473716

Fiber 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[1] (Hi Temp Nylon)	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.

[1] DuPont Registered Trademark

Film Insulations

Insulation	Temperature Rating[1]	AWG Sizes Available	Advantages	Limitations
Polyvinyl Formal (Formvar)	J-W-1177/4 Class105°C Type T MW15-C	10-30	1. Very good resistance to abrasion and solvents. 2. Good electrical properties.	1. Must be stripped before soldering.
Polyurethane	J-W-1177/41 Class 155°C Type SPU MW79-C	32-44	1. Solderable at 750° F. to 800° F. 2. Good film flrexibility. 3. Good moisture and chemical resistance. 4. Excellent electrical properties, contributing to the manufacture of high "Q" coils.	1. Lower abrasion resistance than Polyvinyl Formal, Polyurethane with Nylon overcoat or Polyester, Polyester-amide-imide.
Polyurethane with Nylon overcoat	J-W-1177/42 Class 155°C Type SPUN MW80-C J-W-1177/9 Class 130°C Type SUN MW28-C	25-44 10-24	1. Solderable at 750° F. to 800° F. 2. Excellent film flexibility and abrasion resistance. 3. Good electrical properties.	1. Not recommended for use in hot transformer oil or freon gases.
Polyester-imide Solderable	J-W-1177/39 Class 180°C Type SPEI MW77-C	26-40	1. Solderable at 800° F. to 850° F. 2. Good electrical properties. 3. Compatible with most varnishes and solvents.	1. Lower abrasion resistance than Polyurethane with Nylon over-coat or Polyester-amide-imide. 2. Not recommended for use in hot transformer oil or freon gases.
Polyester with Polyamide-imide overcoat[2] **Polyester-amide-imide**[2]	J-W-1177/14 Class 200°C Type K MW35-C J-W-1177/43 Class 200°C Type PEAI MW74-C	10-44	1. Good flexibility and abrasion resistance (windability). 2. High solvent resistance. 3. Superior dielectric strength. 4. Excellent electrical properties and excellent moisture resistance.	1. Not recommended for use in oil-filled power and distribution transformers containing paper or other cellulosic materials. 2. Must be stripped before soldering.
Polyimide (ML)	J-W-1177/15 Class 220° Type M MW16-C`	12-30	1. Excellent flexibility. 2. Adequate abrasion resistance. 3. High dielectric strength.	1. Will solvent craze. 2. Must be annealed 30 to 60 minutes at 175° to 200° C before varnish treatment. 3. Must be stripped before soldering.

[1] Per JW1177B and NEMA MW-1000
[2] AWG sizes larger than 30 AWG are to MW35-C, sizes 30 AWG and finer are to MW74-C.

Single Film Coated—Round

AWG SIZE	AWG Nom. Bare Wire Dia.	Film Addition Min.	Film Addition Max.	Outside Diameter Min. O.D. (Inches)	Outside Diameter Nom. O.D. (Inches)	Outside Diameter Max. O.D. (Inches)	Weight at 20°C (68°F) LBS/MFT Nom.	Weight at 20°C (68°F) FT/LB Nom.	Resistance at 20°C (68°F) OHMS/MFT Nom.	Resistance at 20°C (68°F) OHMS/LB Nom.	Wires Per Sq. Inch	AWG Size
8	.1285	.0016	.0026	.1288	.1306	.1324	50.23	19.91	.6281	.01250	59	8
9	.1144	.0016	.0026	.1149	.1165	.1181	39.80	25.13	.7925	.01991	74	9
10	.1019	.0015	.0025	.1024	.1039	.1054	31.57	31.68	.9987	.03163	93	10
11	.0907	.0015	.0025	.0913	.0927	.0941	25.05	39.92	1.261	.0503	116	11
12	.0808	.0014	.0024	.0814	.0827	.0840	19.93	50.18	1.588	.0797	146	12
13	.0720	.0014	.0023	.0727	.0739	.0750	15.81	63.25	2.001	.1266	183	13
14	.0641	.0016	.0023	.0651	.0658	.0666	12.50	80.00	2.524	.2019	230	14
15	.0571	.0015	.0022	.0580	.0587	.0594	9.95	100.50	3.181	.3197	288	15
16	.0508	.0014	.0021	.0517	.0524	.0531	7.89	126.7	4.018	.5093	363	16
17	.0453	.0014	.0020	.0462	.0468	.0475	6.26	159.7	5.054	.8073	455	17
18	.0403	.0013	.0019	.0412	.0418	.0424	4.97	201.2	6.386	1.2849	572	18
19	.0359	.0012	.0019	.0367	.0373	.0379	3.95	253.2	8.046	2.0370	715	19
20	.0320	.0012	.0018	.0329	.0334	.0339	3.13	319.5	10.13	3.2364	896	20
21	.0285	.0011	.0018	.0293	.0298	.0303	2.483	402.7	12.77	5.143	1119	21
22	.0253	.0011	.0017	.0261	.0266	.0270	1.970	507.6	16.20	8.223	1403	22
23	.0226	.0010	.0016	.0234	.0238	.0243	1.565	639.0	20.30	12.971	1751	23
24	.0201	.0010	.0015	.0209	.0213	.0217	1.240	806.5	25.67	20.702	2204	24
25	.0179	.0009	.0014	.0186	.0190	.0194	.988	1012.1	32.37	32.763	2741	25
26	.0159	.0009	.0013	.0166	.0170	.0173	.784	1276.	41.02	52.32	3460	26
27	.0142	.0008	.0013	.0149	.0152	.0156	.623	1605.	51.44	82.57	4272	27
28	.0126	.0008	.0012	.0133	.0136	.0140	.495	2020.	65.31	131.94	5407	28
29	.0113	.0007	.0012	.0119	.0122	.0126	.394	2538.	81.21	206.12	6610	29
30	.0100	.0007	.0011	.0106	.0109	.0112	.312	3205.	103.7	332.37	8417	30
31	.0089	.0006	.0010	.0094	.0097	.0100	.248	4032.	130.9	527.8	10628	31
32	.0080	.0006	.0010	.0085	.0088	.0091	.1966	5086.	162.0	824.0	12913	32
33	.0071	.0005	.0009	.0075	.0078	.0081	.1570	6369.	205.7	1310.2	16437	33
34	.0063	.0005	.0008	.0067	.0070	.0072	.1244	8039.	261.3	2100.5	20408	34
35	.0056	.0004	.0007	.0059	.0062	.0064	.0989	10111.	330.7	3343.8	26015	35
36	.0050	.0004	.0007	.0053	.0056	.0058	.0788	12690.	414.8	5264.	31888	36
37	.0045	.0003	.0006	.0047	.0050	.0052	.0624	16026.	512.1	8207.	40000	37
38	.0040	.0003	.0006	.0042	.0045	.0047	.0494	20243.	648.2	13121.	49383	38
39	.0035	.0002	.0005	.0036	.0039	.0041	.0393	25445.	846.6	21542.	65746	39
40	.0031	.0002	.0005	.0032	.0035	.0037	.0313	31949.	1079.	34473.	81633	40
41	.0028	.0002	.0004	.0029	.0031	.0033	.02470	40486.	1323.	53563.	104058	41
42	.0025	.0002	.0004	.0026	.0028	.0030	.01946	51387.	1659.	85252.	127551	42
43	.0022	.0002	.0003	.0023	.0025	.0026	.01548	64599.	2143.	138437.	160000	43
44	.0020	.0001	.0003	.0020	.0022	.0024	.01233	81103.	2593.	210300.	206611	44
45	.00176	.0001	.00022	.00179	.0019	.00205	.00965	103626.	3348.	346943.	345304	45
46	.00157	.0001	.00021	.00161	.00173	.00185	.00767	130378.	4207.	548501.	420521	46
47	.00140	.0001	.00024	.00145	.00158	.00170	.00615	162601.	5291.	860325.	510204	47
48	.00124	.0001	.00021	.00129	.00140	.00150	.00487	205338.	6745.	1385010.	649773	48

Heavy Film Coated—Round

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