

Technical Information



AWG/Metric Conductor Table

AWG	Stranding	Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
		Inch	mm	CMA	mm ²	Lb/1000 ft	kg/km	Ohms/1000 ft	Ohms/km	Ohms/1000 ft	Ohms/km
38	Solid	0.0040	0.102	16.0	0.008	0.048	0.071	648	2126	696	2283
38	7/46	0.0047	0.119	17.2	0.009	0.053	0.079	614	2014	659	2162
36	Solid	0.0050	0.127	25.0	0.013	0.076	0.113	415	1362	445	1460
36	7/44	0.0060	0.152	28.0	0.014	0.086	0.128	378	1240	406	1332
34	Solid	0.0063	0.160	39.7	0.020	0.120	0.179	261	856	280	919
34	7/42	0.0075	0.191	43.8	0.022	0.135	0.201	242	794	260	853
32	Solid	0.0080	0.203	64.0	0.032	0.194	0.289	162	531	174	571
32	7/40	0.0093	0.236	67.3	0.034	0.208	0.310	157	515	169	554
32	19/44	0.0100	0.254	76.0	0.039	0.235	0.350	139	456	149	489
30	Solid	0.0100	0.254	100	0.051	0.303	0.451	104	341	111	364
30	7/38	0.0120	0.305	112	0.057	0.346	0.515	94.5	310	101	331
30	19/42	0.0125	0.318	119	0.060	0.367	0.546	89.1	292	95.6	314
28	Solid	0.0126	0.320	159	0.081	0.481	0.716	65.2	214	69.3	227
28	7/36	0.0150	0.381	175	0.089	0.540	0.804	60.4	198	64.9	213
28	19/40	0.0155	0.394	183	0.093	0.564	0.839	57.9	190	62.2	204
27	7/35	0.017	0.432	220	0.111	0.679	1.01	48.1	158	51.7	170
26	Solid	0.0159	0.404	253	0.128	0.766	1.14	41.0	135	43.5	143
26	7/34	0.019	0.483	278	0.141	0.858	1.28	38.1	125	40.9	134
26	10/36	0.019	0.483	250	0.127	0.772	1.15	42.3	139	45.4	149
26	19/38	0.020	0.508	304	0.154	0.939	1.40	34.8	114	37.4	123
25	7/.0067	0.020	0.508	314	0.159	0.970	1.44	33.7	111	36.1	118
25	7/33	0.021	0.533	353	0.179	1.09	1.62	30.0	98.4	32.2	106
25	40/40	0.023	0.584	384	0.195	1.19	1.77	27.5	90.2	29.5	96.8
24	Solid	0.0201	0.511	404	0.205	1.22	1.82	25.7	84.3	26.7	87.6
24	7/32	0.024	0.610	448	0.227	1.38	2.05	23.6	77.4	25.3	83.0
24	10/34	0.023	0.584	397	0.201	1.23	1.83	26.6	87.3	28.6	93.8
24	19/36	0.025	0.635	475	0.241	1.47	2.19	22.3	73.2	23.9	78.4
22	Solid	0.0253	0.643	640	0.324	1.94	2.89	16.2	53.1	16.9	55.4
22	7/.0096	0.029	0.737	645	0.327	1.99	2.96	16.4	53.8	17.6	57.7
22	7/30	0.030	0.762	700	0.355	2.16	3.21	15.1	49.5	16.2	53.1
22	16/34	0.030	0.762	635	0.322	1.96	2.92	16.7	54.8	17.9	58.7
22	19/34	0.0315	0.800	754	0.382	2.33	3.47	14.0	45.9	15.1	49.5
20	Solid	0.032	0.813	1024	0.519	3.10	4.61	10.1	33.1	10.5	34.4
20	7/.0121	0.036	0.914	1022	0.518	3.16	4.70	10.4	34.1	11.0	36.1
20	7/28	0.038	0.965	1113	0.564	3.44	5.12	9.5	31.2	10.1	33.1
20	10/30	0.037	0.940	1000	0.507	3.09	4.60	10.6	34.8	11.4	37.4
20	19/32	0.040	1.016	1216	0.616	3.75	5.58	8.7	28.5	9.3	30.6
20	26/34	0.038	0.965	1032	0.523	3.19	4.75	10.2	33.5	11.0	36.1
20	41/36	0.037	0.940	1025	0.519	3.16	4.70	10.3	33.8	11.1	36.4
20	63(7x9)/38	0.040	1.016	1008	0.511	3.17	4.72	10.7	35.1	11.5	37.7

*Nominal resistance at 20°C.

AWG/Metric Conductor Table

AWG	Stranding	Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
		Inch	mm	CMA	mm ²	Lb/1000 ft	kg/km	Ohms/1000 ft	Ohms/km	Ohms/1000 ft	Ohms/km
18	Solid	0.040	1.016	1624	0.823	4.92	7.32	6.39	21.0	6.64	21.8
18	7/.0152	0.046	1.168	1617	0.819	4.99	7.43	6.54	21.5	6.95	22.8
18	7/26	0.048	1.219	1771	0.897	5.47	8.14	5.97	19.6	6.34	20.8
18	16/30	0.047	1.194	1600	0.811	4.94	7.35	6.61	21.7	7.10	23.3
18	19/30	0.050	1.270	1900	0.963	5.87	8.74	5.57	18.3	5.98	19.6
18	41/34	0.047	1.194	1628	0.825	5.03	7.49	6.50	21.3	6.98	22.9
18	65/36	0.047	1.194	1625	0.823	5.02	7.47	6.51	21.4	6.99	22.9
18	105(7x15)/38	0.052	1.321	1680	0.851	5.29	7.87	6.42	21.1	6.89	22.6
16	Solid	0.051	1.295	2581	1.31	7.81	11.62	4.02	13.2	4.18	13.7
16	7/.0192	0.058	1.473	2583	1.31	7.98	11.88	4.10	13.5	4.35	14.3
16	7/24	0.060	1.524	2828	1.43	8.73	12.99	3.74	12.3	3.89	12.8
16	19/.0117	0.059	1.499	2603	1.32	8.04	11.96	4.06	13.3	4.32	14.2
16	19/29	0.057	1.448	2432	1.23	7.51	11.18	4.35	14.3	4.62	15.2
16	26/30	0.060	1.524	2600	1.32	8.03	11.95	4.07	13.4	4.37	14.3
16	65/34	0.059	1.499	2580	1.31	7.97	11.86	4.10	13.5	4.40	14.4
16	168(7x24)/38	0.067	1.702	2688	1.36	8.46	12.59	4.01	13.2	4.31	14.1
14	Solid	0.064	1.626	4109	2.08	12.4	18.45	2.52	8.27	2.62	8.60
14	7/22	0.076	1.930	4480	2.27	13.8	20.53	2.36	7.74	2.46	8.07
14	7/.0242	0.073	1.854	4102	2.08	12.7	18.90	2.58	8.46	2.68	8.79
14	19/.0147	0.074	1.880	4104	2.08	12.7	18.90	2.58	8.46	2.74	8.99
14	19/27	0.071	1.803	3838	1.94	11.8	17.56	2.76	9.06	2.93	9.61
14	41/30	0.074	1.880	4100	2.08	12.7	18.90	2.58	8.46	2.77	9.09
14	105/34	0.075	1.905	4168	2.11	12.9	19.20	2.54	8.33	2.72	8.92
14	266(7x38)/38	0.080	2.032	4256	2.16	13.4	19.94	2.53	8.30	2.72	8.92
12	Solid	0.081	2.057	6529	3.31	19.8	29.47	1.59	5.22	1.65	5.41
12	7/20	0.096	2.438	7168	3.63	22.1	32.88	1.48	4.85	1.53	5.02
12	7/.0305	0.092	2.337	6510	3.30	20.1	29.91	1.62	5.31	1.69	5.54
12	19/.0185	0.093	2.362	6498	3.29	20.1	29.91	1.63	5.35	1.73	5.68
12	19/25	0.090	2.286	6080	3.08	18.8	27.98	1.74	5.71	1.85	6.07
12	65/30	0.093	2.362	6500	3.29	20.1	29.91	1.63	5.35	1.75	5.74
12	168(7x24)/34	0.106	2.692	6670	3.38	21.0	31.25	1.62	5.31	1.74	5.71
12	413(7x59)/38	0.106	2.692	6608	3.35	20.8	30.95	1.63	5.35	1.75	5.74
10	Solid	0.102	2.591	10384	5.26	31.4	46.73	0.999	3.28	1.04	3.41
10	7/.0385	0.116	2.946	10374	5.26	32.0	47.62	1.02	3.35	1.06	3.48
10	19/.0234	0.117	2.972	10412	5.28	32.1	47.77	1.02	3.35	1.06	3.48
10	19/23	0.113	2.870	9709	4.92	30.0	44.64	1.09	3.58	1.13	3.71
10	37/.0167	0.117	2.972	10323	5.23	31.9	47.47	1.02	3.35	1.09	3.58
10	37/26	0.111	2.819	9361	4.74	28.9	43.01	1.13	3.71	1.20	3.94
10	105/30	0.118	2.997	10500	5.32	32.4	48.22	1.01	3.31	1.08	3.54
10	658(7x94)/38	0.132	3.353	10528	5.33	33.1	49.26	1.02	3.35	1.10	3.61

*Nominal resistance at 20°C.

AWG/Metric Conductor Table

AWG	Stranding	Approx OD		Area		Weight		DC Resistance (Bare)*		DC Resistance (Tinned)*	
		Inch	mm	CMA	mm ²	Lb/1000 ft	kg/km	Ohms/1000 ft	Ohms/km	Ohms/1000 ft	Ohms/km
8	Solid	0.129	3.277	16512	8.37	50.0	74.41	0.628	2.06	0.646	2.12
8	19/.0295	0.148	3.759	16530	8.38	51.0	75.90	0.640	2.10	0.665	2.18
8	19/21	0.143	3.632	15428	7.82	47.6	70.84	0.686	2.25	0.713	2.34
8	49(7x7)/.0184	0.166	4.216	16611	8.42	52.3	77.83	0.649	2.13	0.690	2.26
8	65/26	0.148	3.759	16445	8.33	50.8	75.60	0.643	2.11	0.683	2.24
8	133(7x19)/29	0.169	4.293	17024	8.63	53.6	79.77	0.634	2.08	0.673	2.21
8	168(7x24)/30	0.167	4.242	16800	8.51	52.9	78.72	0.642	2.11	0.689	2.26
8	266(7x38)/32	0.166	4.216	17024	8.63	53.6	79.77	0.634	2.08	0.680	2.23
6	19/.0372	0.186	4.724	26296	13.3	81.2	120.84	0.402	1.32	0.418	1.37
6	19/19	0.180	4.572	24491	12.4	75.6	112.51	0.432	1.42	0.449	1.47
6	37/23	0.158	4.013	18907	9.58	58.4	86.91	0.559	1.83	0.582	1.91
6	49(7x7)/.0231	0.208	5.283	26166	13.3	81.6	121.43	0.408	1.34	0.425	1.39
6	105/26	0.188	4.775	26565	13.5	82.0	122.03	0.398	1.31	0.423	1.39
6	133(7x19)/27	0.213	5.410	26866	13.6	84.6	125.90	0.401	1.32	0.426	1.40
6	266(7x38)/30	0.210	5.334	26600	13.5	83.7	124.56	0.405	1.33	0.435	1.43
6	413(7x59)/32	0.212	5.385	26432	13.4	83.2	123.82	0.408	1.34	0.438	1.44
4	19/.0469	0.235	5.969	41800	21.2	129	191.97	0.253	0.830	0.263	0.863
4	49(7x7)/.0292	0.263	6.680	41797	21.2	130	193.46	0.256	0.840	0.266	0.873
4	133(7x19)/25	0.269	6.833	42560	21.6	134	199.41	0.253	0.830	0.269	0.883
4	168(7x24)/26	0.266	6.756	42504	21.5	134	199.41	0.254	0.833	0.270	0.886
4	413(7x59)/30	0.265	6.731	41300	20.9	130	193.46	0.261	0.856	0.280	0.919
4	420(7x60)/30	0.268	6.807	42000	21.3	132	196.44	0.257	0.843	0.276	0.906
4	665(19x35)/32	0.270	6.858	42560	21.6	134	199.41	0.253	0.830	0.272	0.892
2	19/.0591	0.296	7.518	66367	33.6	205	305.07	0.159	0.522	0.166	0.545
2	133(7x19)/23	0.339	8.611	67963	34.4	214	318.47	0.159	0.522	0.165	0.541
2	259(7x37)/26	0.334	8.484	65527	33.2	207	308.05	0.165	0.541	0.176	0.577
2	266(7x38)/26	0.334	8.484	67298	34.1	212	315.49	0.160	0.525	0.170	0.558
2	665 (7x95)/30	0.336	8.534	66500	33.7	209	311.03	0.162	0.531	0.174	0.571
2	665(19x35)/30	0.338	8.585	66500	33.7	209	311.03	0.162	0.531	0.174	0.571
2	1045(19x55)/32	0.342	8.687	66880	33.9	213	316.98	0.163	0.535	0.175	0.574
1	19/.0664	0.332	8.433	83771	42.4	259	385.43	0.126	0.413	0.131	0.430
1	133(7x19)/22	0.380	9.652	85120	43.1	268	398.83	0.127	0.417	0.132	0.433
1	259(7x37)/25	0.376	9.550	82880	42.0	262	389.90	0.131	0.430	0.139	0.456
1	836(19x44)/30	0.383	9.728	83600	42.4	266	395.85	0.130	0.427	0.140	0.459
1/0	19/.0745	0.373	9.474	105450	53.4	326	485.14	0.100	0.328	0.104	0.341
1/0	133(7x19)/21	0.428	10.871	107996	54.7	340	505.98	0.100	0.328	0.104	0.341
1/0	259(7x37)/24	0.422	10.719	104636	53.0	331	492.58	0.104	0.341	0.108	0.354
1/0	1045(19x55)/30	0.428	10.871	104500	53.0	332	494.07	0.104	0.341	0.112	0.367
1/0	1064(19x56)/30	0.430	10.922	106400	53.9	338	503.00	0.102	0.335	0.110	0.361
2/0	19/.0837	0.419	10.643	133114	67.4	411	611.64	0.079	0.259	0.083	0.272
2/0	133(7x19)/20	0.480	12.192	136192	69.0	429	638.42	0.079	0.259	0.082	0.269
2/0	259(7x37)/23	0.474	12.040	132349	67.1	419	623.54	0.082	0.269	0.085	0.279
2/0	1323(7x7x27)/30	0.539	13.691	132300	67.0	424	630.98	0.083	0.272	0.089	0.292
2/0	1330(19x70)/30	0.483	12.268	133000	67.4	427	635.45	0.083	0.272	0.089	0.292

*Nominal resistance at 20°C.

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		Inch	mm	CMA	mm ²	Lb/1000 ft	kg/km	Ohms/1000 ft	Ohms/km	Ohms/1000 ft	Ohms/km
3/0	19/.0940	0.470	11.938	167884	85.1	518	770.87	0.063	0.207	0.066	0.217
3/0	133(7x19)/19	0.538	13.665	171437	86.9	540	803.61	0.063	0.207	0.065	0.213
3/0	259(7x37)/22	0.530	13.462	165760	84.0	524	779.80	0.065	0.213	0.068	0.223
3/0	1666(7x7x34)/30	0.604	15.342	166600	84.4	535	796.17	0.066	0.217	0.071	0.233
3/0	1672(19x88)/30	0.540	13.716	167200	84.7	536	797.66	0.066	0.217	0.071	0.233
4/0	19/.1055	0.528	13.411	211470	107	653	971.77	0.050	0.164	0.051	0.167
4/0	133(7x19)/18	0.604	15.342	215992	109	680	1011.95	0.050	0.164	0.052	0.171
4/0	259(7x37)/21	0.598	15.189	210308	107	665	989.63	0.052	0.171	0.054	0.177
4/0	2107(7x7x43)/30	0.681	17.297	210700	107	676	1006.00	0.052	0.171	0.056	0.184
4/0	2109 (37x57)/30	0.590	14.986	210900	107	677	1007.49	0.052	0.171	0.056	0.184

*Nominal resistance at 20°C.

AWG/Metric Comparison

Stranded Conductors

Cond. Diameter (mm ²)	Stranding x Strand Dia. (mm)	Corresponding AWG	Cond. Diameter (mm ²)	Stranding x Strand Dia. (mm)	Corresponding AWG	Cond. Diameter (mm ²)	Stranding x Strand Dia. (mm)	Corresponding AWG
0.014	7 x 0.05	-	0.283	1 x 0.60	-	1.276	26 x 0.25	16
0.035	7 x 0.08	32	0.291	37 x 0.10	-	1.327	1 x 1.30	16
0.047	24 x 0.05	-	0.314	40 x 0.10	-	1.343	19 x 0.30	16
0.049	1 x 0.25	30	0.322	1 x 0.64	22	1.374	7 x 0.50	16
0.055	7 x 0.10	30	0.336	19 x 0.15	22	1.473	30 x 0.25	-
0.079	10 x 0.10	-	0.344	7 x 0.25	22	1.508	12 x 0.40	-
0.079	7 x 0.12	-	0.377	12 x 0.20	-	1.828	19 x 0.35	14
0.080	1 x 0.32	28	0.377	48 x 0.10	-	1.885	60 x 0.20	-
0.093	7 x 0.13	28	0.389	22 x 0.15	-	1.909	27 x 0.030	-
0.094	12 x 0.10	-	0.442	1 x 0.75	-	1.979	7 x 0.60	-
0.094	48 x 0.05	-	0.459	26 x 0.15	20	2.011	16 x 0.40	-
0.096	19 x 0.08	28	0.491	10 x 0.25	20	2.013	41 x 0.25	14
0.113	10 x 0.12	-	0.495	7 x 0.30	-	2.087	1 x 1.63	14
0.118	60 x 0.05	-	0.503	16 x 0.20	-	2.454	50 x 0.25	14
0.118	15 x 0.10	-	0.515	1 x 0.81	20	3.022	19 x 0.45	12
0.124	7 x 0.15	26	0.563	7 x 0.32	20	3.142	16 x 0.50	-
0.126	1 x 0.40	26	0.597	19 x 0.20	20	3.181	45 x 0.30	-
0.149	19 x 0.10	26	0.636	36 x 0.15	-	3.191	65 x 0.25	12
0.177	10 x 0.15	24	0.754	24 x 0.20	-	3.393	48 x 0.30	-
0.188	24 x 0.10	-	0.785	16 x 0.25	18	3.958	56 x 0.30	-
0.196	1 x 0.50	24	0.817	1 x 1.02	18	4.650	37 x 0.40	-
0.212	27 x 0.10	-	0.848	12 x 0.30	-	4.714	7 x 7 x 0.35	-
0.212	12 x 0.15	-	0.880	7 x 0.40	18	5.154	105 x 0.25	-
0.220	7 x 0.20	24	0.933	19 x 0.25	18	5.160	73 x 0.30	10
0.251	32 x 0.10	-	0.990	56 x 0.15	-	5.300	75 x 0.30	10
0.252	19 x 0.13	24	1.005	32 x 0.20	-			

Conductor Color Coding

Multipair Cables

Chart A							
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Black +Red	14	Green + Blue	27	Brown + Yellow	40	Slate + Blue
2	Black + White	15	Green + White	28	Violet + Red	41	Slate + Brown
3	Black + Green	16	Green + Brown	29	Violet + White	42	Slate + Yellow
4	Black + Blue	17	Green + Orange	30	Violet + Green	43	Slate + Orange
5	Black + Brown	18	Green + Yellow	31	Violet + Blue	44	Slate + Black
6	Black + Yellow	19	White + Blue	32	Violet + Brown	45	White/Black + Red
7	Black + Orange	20	White + Brown	33	Violet + Yellow	46	White/Black + Green
8	Red + Green	21	White + Orange	34	Violet + Orange	47	White/Black + Blue
9	Red + White	22	White + Yellow	35	Violet + Slate	48	White/Black + Brown
10	Red + Blue	23	Blue + Brown	36	Violet + Black	49	White/Black + Yellow
11	Red + Yellow	24	Blue + Orange	37	Slate + Red	50	White/Black + Orange
12	Red + Brown	25	Blue + Yellow	38	Slate + White	51	White/Black + Violet
13	Red + Orange	26	Brown + Orange	39	Slate + Green		

Chart A1							
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Black +Red	14	Green + White	27	Brown + Orange	40	Slate + Blue
2	Black + White	15	Green + Blue	28	Violet + Red	41	Slate + Brown
3	Black + Green	16	Green + Yellow	29	Violet + White	42	Slate + Yellow
4	Black + Blue	17	Green + Brown	30	Violet + Green	43	Slate + Orange
5	Black + Yellow	18	Green + Orange	31	Violet + Blue	44	Slate + Black
6	Black + Brown	19	White + Blue	32	Violet + Brown	45	White/Black + Red
7	Black + Orange	20	White + Yellow	33	Violet + Yellow	46	White/Black + Green
8	Red + White	21	White + Brown	34	Violet + Orange	47	White/Black + Blue
9	Red + Green	22	White + Orange	35	Violet + Slate	48	White/Black + Brown
10	Red + Blue	23	Blue + Yellow	36	Violet + Black	49	White/Black + Yellow
11	Red + Yellow	24	Blue + Brown	37	Slate + Red	50	White/Black + Orange
12	Red + Brown	25	Blue + Orange	38	Slate + White	51	White/Black + Violet
13	Red + Orange	26	Brown + Yellow	39	Slate + Green		

Chart B							
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination		
1	White +Black	35	Orange +Slate	69	White/Red +Green		
2	White +Brown	36	Yellow +Green	70	White/Red +Blue		
3	White +Red	37	Yellow +Blue	71	White/Red +Violet		
4	White +Orange	38	Yellow +Violet	72	White/Red +Slate		
5	White +Yellow	39	Yellow +Slate	73	White/Orange +Black		
6	White +Green	40	Green +Blue	74	White/Orange +Brown		
7	White +Blue	41	Green +Violet	75	White/Orange +Red		
8	White +Violet	42	Green +Slate	76	White/Orange +Orange		
9	White +Slate	43	Blue +Violet	77	White/Orange +Yellow		
10	Black +Brown	44	Blue +Slate	78	White/Orange +Green		
11	Black +Red	45	Violet +Slate	79	White/Orange +Blue		
12	Black +Orange	46	White/Black +Black	80	White/Orange +Violet		
13	Black +Yellow	47	White/Black +Brown	81	White/Orange +Slate		
14	Black +Green	48	White/Black +Red	82	White/Yellow +Black		
15	Black +Blue	49	White/Black +Orange	83	White/Yellow +Brown		
16	Black +Violet	50	White/Black +Yellow	84	White/Yellow +Red		
17	Black +Slate	51	White/Black +Green	85	White/Yellow +Orange		
18	Brown +Red	52	White/Black +Blue	86	White/Yellow +Yellow		
19	Brown +Orange	53	White/Black +Violet	87	White/Yellow +Green		
20	Brown +Yellow	54	White/Black +Slate	88	White/Yellow +Blue		
21	Brown +Green	55	White/Brown +Black	89	White/Yellow +Violet		
22	Brown +Blue	56	White/Brown +Brown	90	White/Yellow +Slate		
23	Brown +Violet	57	White/Brown +Red	91	White/Green +Black		
24	Brown +Slate	58	White/Brown +Orange	92	White/Green +Brown		
25	Red +Orange	59	White/Brown +Yellow	93	White/Green +Red		
26	Red +Yellow	60	White/Brown +Green	94	White/Green +Orange		
27	Red +Green	61	White/Brown +Blue	95	White/Green +Yellow		
28	Red +Blue	62	White/Brown +Violet	96	White/Green +Green		
29	Red +Violet	63	White/Brown +Slate	97	White/Green +Blue		
30	Red +Slate	64	White/Red +Black	98	White/Green +Violet		
31	Orange +Yellow	65	White/Red +Brown	99	White/Green +Slate		
32	Orange +Green	66	White/Red +Red	100	White/Blue +Black		
33	Orange +Blue	67	White/Red +Orange	101	White/Blue +Brown		
34	Orange +Violet	68	White/Red +Yellow	102	White/Blue +Red		

Conductor Color Coding

Multipair Cables

Chart BR							
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Black #1 + Red #1	14	Black #14 + Red #14	27	Black #27 + Red #27	40	Black #40 + Red #40
2	Black #2 + Red #2	15	Black #15 + Red #15	28	Black #28 + Red #28	41	Black #41 + Red #41
3	Black #3 + Red #3	16	Black #16 + Red #16	29	Black #29 + Red #29	42	Black #42 + Red #42
4	Black #4 + Red #4	17	Black #17 + Red #17	30	Black #30 + Red #30	43	Black #43 + Red #43
5	Black #5 + Red #5	18	Black #18 + Red #18	31	Black #31 + Red #31	44	Black #44 + Red #44
6	Black #6 + Red #6	19	Black #19 + Red #19	32	Black #32 + Red #32	45	Black #45 + Red #45
7	Black #7 + Red #7	20	Black #20 + Red #20	33	Black #33 + Red #33	46	Black #46 + Red #46
8	Black #8 + Red #8	21	Black #21 + Red #21	34	Black #34 + Red #34	47	Black #47 + Red #47
9	Black #9 + Red #9	22	Black #22 + Red #22	35	Black #35 + Red #35	48	Black #48 + Red #48
10	Black #10 + Red #10	23	Black #23 + Red #23	36	Black #36 + Red #36	49	Black #49 + Red #49
11	Black #11 + Red #11	24	Black #24 + Red #24	37	Black #37 + Red #37	50	Black #50 + Red #50
12	Black #12 + Red #12	25	Black #25 + Red #25	38	Black #38 + Red #38	51	Black #51 + Red #51
13	Black #13 + Red #13	26	Black #26 + Red #26	39	Black #39 + Red #39		

Chart BW							
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Black + White #1	14	Black + White #14	27	Black + White #27	40	Black + White #40
2	Black + White #2	15	Black + White #15	28	Black + White #28	41	Black + White #41
3	Black + White #3	16	Black + White #16	29	Black + White #29	42	Black + White #42
4	Black + White #4	17	Black + White #17	30	Black + White #30	43	Black + White #43
5	Black + White #5	18	Black + White #18	31	Black + White #31	44	Black + White #44
6	Black + White #6	19	Black + White #19	32	Black + White #32	45	Black + White #45
7	Black + White #7	20	Black + White #20	33	Black + White #33	46	Black + White #46
8	Black + White #8	21	Black + White #21	34	Black + White #34	47	Black + White #47
9	Black + White #9	22	Black + White #22	35	Black + White #35	48	Black + White #48
10	Black + White #10	23	Black + White #23	36	Black + White #36	49	Black + White #49
11	Black + White #11	24	Black + White #24	37	Black + White #37	50	Black + White #50
12	Black + White #12	25	Black + White #25	38	Black + White #38		
13	Black + White #13	26	Black + White #26	39	Black + White #39		

Chart C							
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Blue + White	14	Orange/Slate + White	27	Blue/Orange + Red	40	Slate/White + Red
2	Orange + White	15	Green/White + White	28	Blue/Green + Red	41	Blue + Black
3	Green + White	16	Green/Brown + White	29	Blue/Brown + Red	42	Orange + Black
4	Brown + White	17	Green/Slate + White	30	Blue/Slate + Red	43	Green + Black
5	Slate + White	18	Brown/White + White	31	Orange/White + Red	44	Brown + Black
6	Blue/White + White	19	Brown/Slate + White	32	Orange/Green + Red	45	Slate + Black
7	Blue/Orange + White	20	Slate/White + White	33	Orange/Brown + Red	46	Blue/White + Black
8	Blue/Green + White	21	Blue + Red	34	Orange/Slate + Red	47	Blue/Orange + Black
9	Blue/Brown + White	22	Orange + Red	35	Green/White + Red	48	Blue/Green + Black
10	Blue/Slate + White	23	Green + Red	36	Green/Brown + Red	49	Blue/Brown + Black
11	Orange/White + White	24	Brown + Red	37	Green/Slate + Red	50	Blue/Slate + Black
12	Orange/Green + White	25	Slate + Red	38	Brown/White + Red	51	Orange/White + Black
13	Orange/Brown + White	26	Blue/White + Red	39	Brown/Slate + Red		

Chart K					
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Black + Red	14	Green + White	27	Brown + Orange
2	Black + White	15	Green + Blue	28	Orange + Yellow
3	Black + Green	16	Green + Yellow	29	Violet + Orange
4	Black + Blue	17	Green + Brown	30	Violet + Red
5	Black + Yellow	18	Green + Orange	31	Violet + White
6	Black + Brown	19	White + Blue	32	Violet + Green
7	Black + Orange	20	White + Yellow	33	Violet + Blue
8	Red + White	21	White + Brown	34	Violet + Yellow
9	Red + Green	22	White + Orange	35	Violet + Brown
10	Red + Blue	23	Blue + Yellow	36	Violet + Black
11	Red + Yellow	24	Blue + Brown	37	Slate + White
12	Red + Brown	25	Blue + Orange		
13	Red + Orange	26	Brown + Yellow		

Conductor Color Coding

Multipair Cables

Chart L					
Pair No.	Color Combination			Pair No.	Color Combination
1	White + Blue	10	Red + Slate	19	Yellow + Brown
2	White + Orange	11	Black + Blue	20	Yellow + Slate
3	White + Green	12	Black + Orange	21	Violet + Blue
4	White + Brown	13	Black + Green	22	Violet + Orange
5	White + Slate	14	Black + Brown	23	Violet + Green
6	Red + Blue	15	Black + Slate	24	Violet + Brown
7	Red + Orange	16	Yellow + Blue	25	Violet + Slate
8	Red + Green	17	Yellow + Orange		
9	Red + Brown	18	Yellow + Green		

Chart M					
Pair No.	Color Combination	Pair No.	Color Combination	Pair No.	Color Combination
1	Blue/White + White/Blue	10	Slate/Red + Red/Slate	19	Brown/Yellow + Yellow/Brown
2	Orange/White + White/Orange	11	Blue/Black + Black/Blue	20	Slate/Yellow + Yellow/Slate
3	Green/White + White/Green	12	Orange/Black + Black/Orange	21	Blue/Violet + Violet/Blue
4	Brown/White + White/Brown	13	Green/Black + Black/Green	22	Orange/Violet + Violet/Orange
5	Slate/White + White/Slate	14	Brown/Black + Black/Brown	23	Green/Violet + Violet/Green
6	Blue/Red + Red/Blue	15	Slate/Black + Black/Slate	24	Brown/Violet + Violet/Brown
7	Orange/Red + Red/Orange	16	Blue/Yellow + Yellow/Blue	25	Slate/Violet + Violet/Slate
8	Green/Red + Red/Green	17	Orange/Yellow + Yellow/Orange		
9	Brown/Red + Red/Brown	18	Green/Yellow + Yellow/Green		

Chart N	
Pair No.	Color Combination
1	Black + Yellow
2	Red + Violet
3	Blue + Brown
4	Orange + Green
5	Black/White + White/Black
6	Brown/White + White/Brown
7	Red/White + White/Red
8	Orange/White + White/Orange
9	Yellow/White + White/Yellow
10	Green/White + White/Green
11	Blue/White + White/Blue
12	Violet/White + White/Violet

Chart Q	
Pair No.	Color Combination
1	Black + White
2	Red + Green
3	Brown + Blue
4	Orange + Yellow
5	Violet + Slate
6	Tan + Pink
7	White/Blue + Blue/White
8	White/Brown + Brown/White
9	White/Orange + Orange/White
10	White/Green + Green/White
11	White/Red + Red/White
12	White/Black + Black/White
13	Yellow/Blue + Blue/Yellow
14	Yellow/Brown + Brown/Yellow
15	Yellow/Orange + Orange/Yellow
16	Yellow/Red + Red/Yellow
17	Yellow/Black + Black/Yellow
18	Yellow/Violet + Violet/Yellow

Conductor Color Coding

Multiconductor Cables

Chart D													
No.	Base Color	1st Stripe	2nd Stripe	3rd Stripe					No.	Base Color	1st Stripe	2nd Stripe	3rd Stripe
1	Black				35	White	Red	Red	69	White	Black	Green	Blue
2	Red				36	White	Red	Green	70	White	Black	Green	Brown
3	White				37	White	Red	Blue	71	White	Black	Green	Orange
4	Green				38	White	Red	Brown	72	White	Black	Green	Slate
5	Orange				39	White	Red	Violet	73	White	Black	Green	Violet
6	Blue				40	White	Green	Black	74	White	Black	Yellow	Blue
7	Brown				41	White	Green	Red	75	White	Black	Yellow	Brown
8	Yellow				42	White	Green	Green	76	White	Black	Yellow	Orange
9	Violet				43	White	Green	Blue	77	White	Black	Yellow	Slate
10	Slate				44	White	Green	Brown	78	White	Black	Yellow	Violet
11	Pink				45	White	Green	Violet	79	White	Black	Blue	Brown
12	Tan				46	White	Blue	Black	80	White	Black	Blue	Orange
13	Red	Green			47	White	Blue	Red	81	White	Black	Blue	Slate
14	Red	Yellow			48	White	Blue	Green	82	White	Black	Blue	Violet
15	Red	Black			49	White	Blue	Blue	83	White	Black	Brown	Orange
16	White	Black			50	White	Blue	Brown	84	White	Black	Brown	Slate
17	White	Red			51	White	Blue	Violet	85	White	Black	Brown	Violet
18	White	Green			52	White	Brown	Black	86	White	Black	Orange	Slate
19	White	Yellow			53	White	Brown	Red	87	White	Black	Orange	Violet
20	White	Blue			54	White	Brown	Green	88	White	Black	Slate	Violet
21	White	Brown			55	White	Brown	Blue	89	White	Red	Black	Green
22	White	Orange			56	White	Brown	Brown	90	White	Red	Black	Yellow
23	White	Slate			57	White	Brown	Violet	91	White	Red	Black	Blue
24	White	Violet			58	White	Violet	Red	92	White	Red	Black	Brown
25	White	Black	Red		59	White	Violet	Green	93	White	Red	Black	Orange
26	White	Black	Green		60	White	Violet	Blue	94	White	Red	Black	Slate
27	White	Black	Yellow		61	White	Black	Red	95	White	Red	Black	Violet
28	White	Black	Blue		62	White	Black	Red	96	White	Red	Green	Yellow
29	White	Black	Brown		63	White	Black	Red	97	White	Red	Green	Blue
30	White	Black	Orange		64	White	Black	Red	98	White	Red	Green	Brown
31	White	Black	Slate		65	White	Black	Red	99	White	Red	Green	Orange
32	White	Black	Violet		66	White	Black	Red	100	White	Red	Green	Slate
33	White	Black	Black		67	White	Black	Red					
34	White	Red	Black		68	White	Black	Green					

Chart D1	
No.	Color
1	Black
2	Red
3	White
4	Green
5	Yellow
6	Blue

Chart CE	
No.	Color
1	Green/Yellow
2	Lt. Blue
3	Black
4	Brown

Chart D2			
No.	Base Color	Stripe	
1	Black		
2	White		
3	Red		
4	Green		
5	Brown		
6	Blue		
7	Orange		
8	Yellow		
9	Violet		
10	Slate		
11	Pink		
12	Tan		
13	White	Blue	
14	White	Orange	
15	White	Green	
16	White	Brown	
17	White	Slate	
18	Red	Blue	
19	Red	Orange	
20	Red	Green	
21	Red	Brown	
22	Red	Slate	
23	Green	Blue	
24	Green	Orange	
25	Green	Brown	

Conductor Color Coding

Multiconductor Cables

Chart E														
No.	Base Color	1st Stripe	2nd Stripe	3rd Stripe	No.	Base Color	1st Stripe	2nd Stripe	3rd Stripe	No.	Base Color	1st Stripe	2nd Stripe	3rd Stripe
1	Black				35	White	Red	Orange		69	White	Black	Orange	Green
2	Brown				36	White	Red	Yellow		70	White	Black	Orange	Blue
3	Red				37	White	Red	Green		71	White	Black	Orange	Violet
4	Orange				38	White	Red	Blue		72	White	Black	Orange	Slate
5	Yellow				39	White	Red	Violet		73	White	Black	Yellow	Green
6	Green				40	White	Red	Slate		74	White	Black	Yellow	Blue
7	Blue				41	White	Orange	Yellow		75	White	Black	Yellow	Violet
8	Violet				42	White	Orange	Green		76	White	Black	Yellow	Slate
9	Slate				43	White	Orange	Blue		77	White	Black	Green	Blue
10	White				44	White	Orange	Violet		78	White	Black	Green	Violet
11	White	Black			45	White	Orange	Slate		79	White	Black	Green	Slate
12	White	Brown			46	White	Yellow	Green		80	White	Black	Blue	Violet
13	White	Red			47	White	Yellow	Blue		81	White	Black	Blue	Slate
14	White	Orange			48	White	Yellow	Violet		82	White	Black	Violet	Slate
15	White	Yellow			49	White	Yellow	Slate		83	White	Brown	Red	Orange
16	White	Green			50	White	Green	Blue		84	White	Brown	Red	Yellow
17	White	Blue			51	White	Green	Violet		85	White	Brown	Red	Green
18	White	Violet			52	White	Green	Slate		86	White	Brown	Red	Blue
19	White	Slate			53	White	Blue	Violet		87	White	Brown	Red	Violet
20	White	Black	Brown		54	White	Blue	Slate		88	White	Brown	Red	Slate
21	White	Black	Red		55	White	Violet	Slate		89	White	Brown	Orange	Yellow
22	White	Black	Orange		56	White	Black	Brown	Red	90	White	Brown	Orange	Green
23	White	Black	Yellow		57	White	Black	Brown	Orange	91	White	Brown	Orange	Blue
24	White	Black	Green		58	White	Black	Brown	Yellow	92	White	Brown	Orange	Violet
25	White	Black	Blue		59	White	Black	Brown	Green	93	White	Brown	Orange	Slate
26	White	Black	Violet		60	White	Black	Brown	Blue	94	White	Brown	Yellow	Green
27	White	Black	Slate		61	White	Black	Brown	Violet	95	White	Brown	Yellow	Blue
28	White	Brown	Red		62	White	Black	Brown	Slate	96	White	Brown	Yellow	Violet
29	White	Brown	Orange		63	White	Black	Red	Yellow	97	White	Brown	Yellow	Slate
30	White	Brown	Yellow		64	White	Black	Red	Green	98	White	Brown	Green	Blue
31	White	Brown	Green		65	White	Black	Red	Blue	99	White	Brown	Green	Violet
32	White	Brown	Blue		66	White	Black	Red	Violet	100	White	Brown	Green	Slate
33	White	Brown	Violet		67	White	Black	Red	Slate					
34	White	Brown	Slate		68	White	Black	Orange	Yellow					

Chart F															
No.	Base Color	1st Stripe	2nd Stripe		No.	Base Color	1st Stripe	2nd Stripe		No.	Base Color	1st Stripe	2nd Stripe		
1	Black				21	Orange	Green			41	Green	White	Blue		
2	White				22	Black	White	Red		42	Orange	Red	Green		
3	Red				23	White	Black	Red		43	Blue	Red	Green		
4	Green				24	Red	Black	White		44	Black	White	Blue		
5	Orange				25	Green	Black	White		45	White	Black	Blue		
6	Blue				26	Orange	Black	White		46	Red	White	Blue		
7	White	Black			27	Blue	Black	White		47	Green	Orange	Red		
8	Red	Black			28	Black	Red	Green		48	Orange	Red	Blue		
9	Green	Black			29	White	Red	Green		49	Blue	Red	Orange		
10	Orange	Black			30	Red	Black	Green		50	Black	Orange	Red		
11	Blue	Black			31	Green	Black	Orange		51	White	Black	Orange		
12	Black	White			32	Orange	Black	Green		52	Red	Orange	Black		
13	Red	White			33	Blue	White	Orange		53	Green	Red	Blue		
14	Green	White			34	Black	White	Orange		54	Orange	Black	Blue		
15	Blue	White			35	White	Red	Orange		55	Blue	Black	Orange		
16	Black	Red			36	Orange	White	Blue		56	Black	Orange	Green		
17	White	Red			37	White	Red	Blue		57	White	Orange	Green		
18	Orange	Red			38	Black	White	Green		58	Red	Orange	Green		
19	Blue	Red			39	White	Black	Green		59	Green	Black	Blue		
20	Red	Green			40	Red	White	Green		60	Orange	Green	Blue		

Chart G														
No.	Base Color	Stripe	No.	Base Color	Stripe	No.	Base Color	Stripe	No.	Base Color	Stripe	No.	Base Color	Stripe
1	White		6	Blue		11	White	Black	6	Blue		11	White	Black
2	Black		7	Brown		12	White	Brown	12	White	Brown	12	White	Brown
3	Red		8	Orange		13	White	Red	13	White	Red	13	White	Red
4	Green		9	Slate		14	White	Orange	14	White	Orange	14	White	Orange
5	Yellow		10	Violet		15	White	Yellow	15	White	Yellow	15	White	Yellow

Conductor Color Coding

Multiconductor Cables

Chart H								
No.	Base Color	Stripe	No.	Base Color	Stripe	No.	Base Color	Stripe
1	Black		8	Orange		15	White	Blue
2	White		9	Slate		16	White	Brown
3	Red		10	Violet		17	White	Violet
4	Green		11	White	Black	18	White	Slate
5	Yellow		12	White	Red	19	Black	Red
6	Blue		13	White	Green	20	Black	Yellow
7	Brown		14	White	Yellow			

Chart I		
No.	Color	
1	Green	
2	White	
3	Brown	
4	Blue	
5	Orange	
6	Yellow	

Chart I2		
No.	Color	Stripe
1	Brown	
2	Blue	
3	Green	Yellow

Chart J					
No.	Base Color	Stripe	No.	Base Color	Stripe
1	Black		20	Yellow	Blue
2	Red		21	Brown	Blue
3	Blue		22	Black	Orange
4	Orange		23	Red	Orange
5	Yellow		24	Blue	Orange
6	Brown		25	Yellow	Orange
7	Red	Black	26	Brown	Orange
8	Blue	Black	27	Black	Yellow
9	Orange	Black	28	Red	Yellow
10	Yellow	Black	29	Blue	Yellow
11	Brown	Black	30	Orange	Yellow
12	Black	Red	31	Brown	Yellow
13	Blue	Red	32	Black	Brown
14	Orange	Red	33	Red	Brown
15	Yellow	Red	34	Blue	Brown
16	Brown	Red	35	Orange	Brown
17	Black	Blue	36	Yellow	Brown
18	Red	Blue	37	Black	
19	Orange	Blue			

Chart J1		
No.	Base Color	Stripe
1	Black #1	
2	Red #2	
3	Blue #3	
4	Orange #4	
5	Yellow #5	
6	Brown #6	
7	Red	Black #7
8	Blue	Black #8
9	Orange	Black #9
10	Yellow	Black #10
11	Brown	Black #11
12	Black	Red #12

Chart KW			
No.	Color	No.	Color
1	Green/Yellow	34	Black #33
2	Black #1	35	Black #34
3	White/Black*	36	Black #35
4	Black #3	37	Black #36
5	Black #4	38	Black #37
6	Black #5	39	Black #38
7	Black #6	40	Black #39
8	Black #7	41	Black #40
9	Black #8	42	Black #41
10	Black #9	43	Black #42
11	Black #10	44	Black #43
12	Black #11	45	Black #44
13	Black #12	46	Black #45
14	Black #13	47	Black #46
15	Black #14	48	Black #47
16	Black #15	49	Black #48
17	Black #16	50	Black #49
18	Black #17	51	Black #50
19	Black #18	52	Black #51
20	Black #19	53	Black #52
21	Black #20	54	Black #53
22	Black #21	55	Black #54
23	Black #22	56	Black #55
24	Black #23	57	Black #56
25	Black #24	58	Black #57
26	Black #25	59	Black #58
27	Black #26	60	Black #59
28	Black #27	61	Black #60
29	Black #28	62	Black #61
30	Black #29	63	Black #62
31	Black #30	64	Black #63
32	Black #31	65	Black #64
33	Black #32		

*The white/black neutral conductor is used only on 18 and 16 AWG cables with conductor counts of 12 or greater.

Conductor Color Coding

Multiconductor Cables

Chart KX					
No.	Color		No.	Color	
1	Green/Yellow	23	Black #22	45	Black #44
2	Black #1	24	Black #23	46	Black #45
3	Black #2	25	Black #24	47	Black #46
4	Black #3	26	Black #25	48	Black #47
5	Black #4	27	Black #26	49	Black #48
6	Black #5	28	Black #27	50	Black #49
7	Black #6	29	Black #28	51	Black #50
8	Black #7	30	Black #29	52	Black #51
9	Black #8	31	Black #30	53	Black #52
10	Black #9	32	Black #31	54	Black #53
11	Black #10	33	Black #32	55	Black #54
12	Black #11	34	Black #33	56	Black #55
13	Black #12	35	Black #34	57	Black #56
14	Black #13	36	Black #35	58	Black #57
15	Black #14	37	Black #36	59	Black #58
16	Black #15	38	Black #37	60	Black #59
17	Black #16	39	Black #38	61	Black #60
18	Black #17	40	Black #39	62	Black #61
19	Black #18	41	Black #40	63	Black #62
20	Black #19	42	Black #41	64	Black #63
21	Black #20	43	Black #42	65	Black #64
22	Black #21	44	Black #43		

Chart LW					
No.	Color	No.	Color	No.	Color
1	Green/Yellow	23	Dk. Blue #22	45	Dk. Blue #44
2	Dk. Blue #1	24	Dk. Blue #23	46	Dk. Blue #45
3	White/Blue*	25	Dk. Blue #24	47	Dk. Blue #46
4	Dk. Blue #3	26	Dk. Blue #25	48	Dk. Blue #47
5	Dk. Blue #4	27	Dk. Blue #26	49	Dk. Blue #48
6	Dk. Blue #5	28	Dk. Blue #27	50	Dk. Blue #49
7	Dk. Blue #6	29	Dk. Blue #28	51	Dk. Blue #50
8	Dk. Blue #7	30	Dk. Blue #29	52	Dk. Blue #51
9	Dk. Blue #8	31	Dk. Blue #30	53	Dk. Blue #52
10	Dk. Blue #9	32	Dk. Blue #31	54	Dk. Blue #53
11	Dk. Blue #10	33	Dk. Blue #32	55	Dk. Blue #54
12	Dk. Blue #11	34	Dk. Blue #33	56	Dk. Blue #55
13	Dk. Blue #12	35	Dk. Blue #34	57	Dk. Blue #56
14	Dk. Blue #13	36	Dk. Blue #35	58	Dk. Blue #57
15	Dk. Blue #14	37	Dk. Blue #36	59	Dk. Blue #58
16	Dk. Blue #15	38	Dk. Blue #37	60	Dk. Blue #59
17	Dk. Blue #16	39	Dk. Blue #38	61	Dk. Blue #60
18	Dk. Blue #17	40	Dk. Blue #39	62	Dk. Blue #61
19	Dk. Blue #18	41	Dk. Blue #40	63	Dk. Blue #62
20	Dk. Blue #19	42	Dk. Blue #41	64	Dk. Blue #63
21	Dk. Blue #20	43	Dk. Blue #42	65	Dk. Blue #64
22	Dk. Blue #21	44	Dk. Blue #43		

*The white/blue neutral conductor is used only on 18 and 16 AWG cables with conductor counts of 12 or greater.

Chart LX		Chart O			
No.	Color	No.	Color	No.	Color
1	Green/Yellow	1	Black	9	Violet
2	Dk. Blue #1	2	White	10	Slate
3	Dk. Blue #2	3	Red	11	Pink
4	Dk. Blue #3	4	Green	12	Tan
5	Dk. Blue #4	5	Brown	13	Black/White
6	Dk. Blue #5	6	Blue	14	Red/White
7	Dk. Blue #6	7	Orange	15	Green/White
8	Dk. Blue #7	8	Yellow		
9	Dk. Blue #8				
10	Dk. Blue #9				
11	Dk. Blue #10				

Conductor Color Coding

Chart P	
No.	Color
1	White
2	Black
3	Red
4	Green
5	Blue
6	Brown
7	Yellow
8	Orange

Chart R						
No.	Base Color	1st Stripe	2nd Stripe			
1	Black			16	White	Black
2	Red			17	White	Red
3	Green			18	White	Green
4	White			19	White	Yellow
5	Brown			20	White	Blue
6	Blue			21	White	Brown
7	Orange			22	White	Orange
8	Yellow			23	White	Slate
9	Violet			24	White	Violet
10	Slate			25	White	Black
11	Pink			26	White	Black
12	Tan			27	White	Black
13	Red	Green		28	White	Black
14	Red	Yellow		29	White	Black
15	Red	Black		30	White	Black

Chart RW					
No.	Color	No.	Color	No.	Color
1	Green/Yellow	23	Red #22	45	Red #44
2	Red #1	24	Red #23	46	Red #45
3	White/Red*	25	Red #24	47	Red #46
4	Red #3	26	Red #25	48	Red #47
5	Red #4	27	Red #26	49	Red #48
6	Red #5	28	Red #27	50	Red #49
7	Red #6	29	Red #28	51	Red #50
8	Red #7	30	Red #29	52	Red #51
9	Red #8	31	Red #30	53	Red #52
10	Red #9	32	Red #31	54	Red #53
11	Red #10	33	Red #32	55	Red #54
12	Red #11	34	Red #33	56	Red #55
13	Red #12	35	Red #34	57	Red #56
14	Red #13	36	Red #35	58	Red #57
15	Red #14	37	Red #36	59	Red #58
16	Red #15	38	Red #37	60	Red #59
17	Red #16	39	Red #38	61	Red #60
18	Red #17	40	Red #39	62	Red #61
19	Red #18	41	Red #40	63	Red #62
20	Red #19	42	Red #41	64	Red #63
21	Red #20	43	Red #42	65	Red #64
22	Red #21	44	Red #43		

*The white/red neutral conductor is used only on 18 and 16 AWG cables with conductor counts of 12 or greater.

Chart RX	
1	Green/Yellow
2	Red #1
3	Red #2
4	Red #3
5	Red #4
6	Red #5
7	Red #6
8	Red #7
9	Red #8
10	Red #9
11	Red #10
12	Red #11

Conductor Color Coding

Hook-Up Wire

Chart Z1	
No.	Color
1	White
2	Black
3	Red
4	Green
5	Yellow
6	Blue
7	Brown
8	Orange
9	Slate
10	Violet
11	White/Black
12	White/Red
13	White/Green
14	White/Yellow
15	White/Blue
16	White/Brown
17	White/Orange
18	White/Slate
19	White/Violet
28	Green/Yellow
29	Yellow/Green
30	Pink

Chart Z2	
No.	Colors
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Slate
9	White
45	Yellow/Green
54	Green/Yellow
90	White/Black
91	White/Brown
92	White/Red
93	White/Orange
94	White/Yellow
95	White/Green
96	White/Blue
97	White/Violet
98	White/Slate
P	Pink
T	Tan
X	Clear

Properties of Common Insulation and Jacket Materials

Plastics									
Property	Low-Density PE	High-Density PE	Cellular PE	Nylon	PP	Cellular PP	PVC	Plenum PVC	PUR
Abrasion Resistance	G	E	F	E	F-G	F-G	F-G	F-G	O
Acid Resistance	G-E	E	G-E	P-F	E	E	G-E	G	F
Alcohol Resistance	E	E	E	P	E	E	P-F	G	P-G
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene, etc.)	G-E	G-E	G	G	P-F	P	P	P	P-G
Alkali Resistance	G-E	E	G-E	E	E	E	G-E	G	F
Aromatic Hydrocarbons Resistance (Benzol, Toluol, etc.)	P	P	P	G	P-F	P	P-F	P-F	P-G
Electrical Properties	E	E	E	P	E	E	F-G	G	P
Flame Resistance	P	P	P	P	P	P	E	E	P
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	G	G	G	G	P	P	P-F	P-F	P-G
Heat Resistance	G	E	G	E	E	E	G-E	G-E	G
Low-Temperature Flexibility	E	E	E	G	P	P	P-G	P-G	G
Nuclear Radiation Resistance	G-E	G-E	G	F-G	F	F	F	F	G
Oil Resistance	G-E	G-E	G	E	F	F	F	F	E
Oxidation Resistance	E	E	E	E	E	E	E	E	E
Ozone Resistance	E	E	E	E	E	E	E	E	E
Underground Burial	G	E	N/A	P	N/A	N/A	P-G	P	G
Water Resistance	E	E	E	P-F	E	E	F-G	F	P-G
Weather, Sun Resistance	E	E	E	E	E	E	G-E	G	G

Ratings based on average performance of general-purpose compounds. Specific properties can usually be improved by selective compounding.

P Poor
F Fair
G Good
E Excellent
O Outstanding

Fluoropolymers							
Property	FEP	PTFE	ETFE	ECTFE	PVDF	TPE	
Abrasion Resistance	E	O	E	E	E	F-G	
Acid Resistance	E	E	E	E	G-E	G	
Alcohol Resistance	E	E	E	E	E	G	
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene, etc.)	E	E	E	E	E	P	
Alkali Resistance	E	E	E	E	E	G-E	
Aromatic Hydrocarbons Resistance (Benzol, Toluol, etc.)	E	E	E	E	G-E	P	
Electrical Properties	E	E	E	E	G-E	E	
Flame Resistance	O	E	G	E-O	E	F-G	
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	E	E	E	E	G		
Heat Resistance	O	O	E	O	O	E	
Low-Temperature Flexibility	O	O	E	O	F	E	
Nuclear Radiation Resistance	P-G	P	E	E	E	G	
Oil Resistance	O	E-O	E	O	E	G	
Oxidation Resistance	O	O	E	O	O	E	
Ozone Resistance	E	O	E	E	E	E	
Underground Burial	E	E	E	E	E	P	
Water Resistance	E	E	E	E	E	G-E	
Weather, Sun Resistance	O	O	E	O	E-O	E	

Ratings based on average performance of general-purpose compounds. Specific properties can usually be improved by selective compounding.

P Poor
F Fair
G Good
E Excellent
O Outstanding

Properties of Common Insulation and Jacket Materials

Rubber				
Property	Rubber	Neoprene	EPDM	Silicone
Abrasion Resistance	E	G-E	G	P
Acid Resistance	F-G	G	G-E	F-G
Alcohol Resistance	G	F	P	G
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene, etc.)	P	G	P	P-F
Alkali Resistance	F-G	G	G-E	F-G
Aromatic Hydrocarbons Resistance (Benzol, Toluol, etc.)	P	P-F	F	P
Electrical Properties	G	P	E	G
Flame Resistance	P	G	P	F-G
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	P	P	P	P-G
Heat Resistance	F	G	E	O
Low-Temperature Flexibility	G	F-G	G-E	O
Nuclear Radiation Resistance	F	F-G	G	E
Oil Resistance	P	G	P	F-G
Oxidation Resistance	F	G	E	E
Ozone Resistance	P	G	E	O
Water Resistance	G	E	G-E	G-E
Weather, Sun Resistance	F	G	E	O

Ratings based on average performance of general-purpose compounds. Specific properties can usually be improved by selective compounding.

P Poor
F Fair
G Good
E Excellent
O Outstanding

Temperature Ranges of Insulation and Jacket Materials				
Material	Normal Low	Normal High	Special Low	Special High
ECTFE	-70°C	150°C	—	—
EPDM	-55°C	105°C	—	150°C
ETFE	-65°C	150°C	—	—
FEP	-70°C	200°C	—	—
Neoprene	-20°C	60°C	-55°C	90°C
PE	-60°C	80°C	—	—
Plenum PVC	-20°C	75°C	—	—
PP	-40°C	105°C	—	—
PTFE	-70°C	260°C	—	—
PVC	-20°C	80°C	-55°C	105°C
PVDF	-20°C	125°C	-40°C	150°/150°C
Rubber	-30°C	60°C	-55°C	75°C
Silicone	-80°C	150°C	—	200°C
TPE	-40°C	105°C	-50°C	125°C

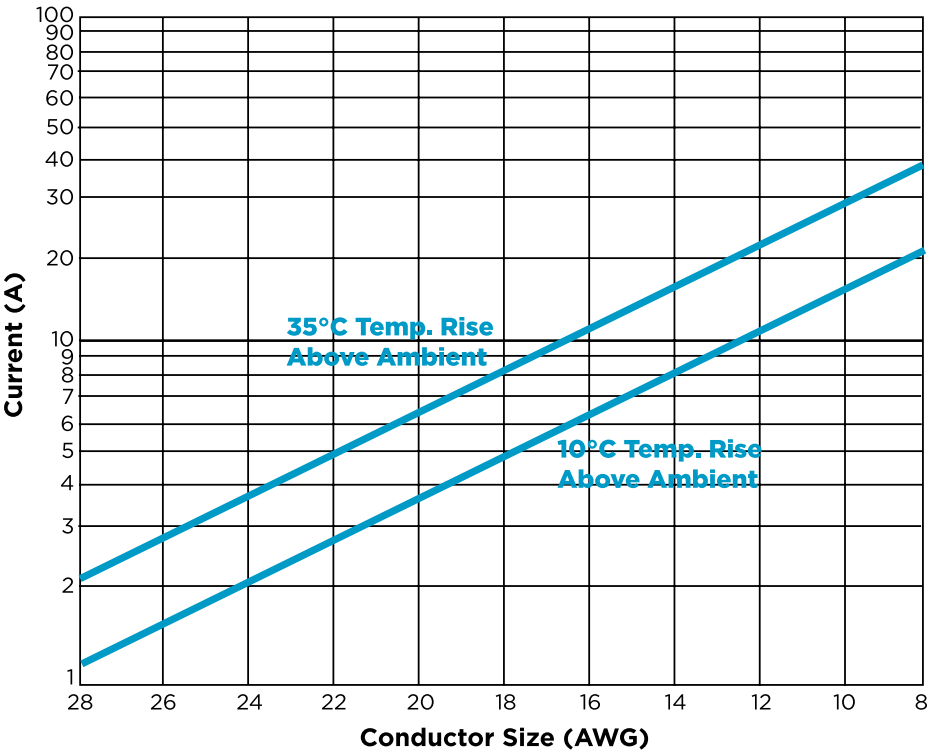
Current Ratings for Alpha Cables

The maximum continuous current rating for a cable is limited by conductor size, number of conductors contained within the cable, maximum temperature rating of the cable, and environmental conditions such as ambient temperature and air flow. To use the current capacity chart, first determine conductor size, temperature rating, and number of conductors from the applicable product description for the cable of interest.

Next, find the current value on the chart for the proper temperature rating and conductor size. To calculate the maximum current rating/conductor, multiply the chart value by the appropriate conductor factor.

The chart assumes cable is surrounded by still air at an ambient temperature of 25°C. Current values are in RMS amperes and are valid for copper conductors only. For conditions other than specified, contact Alpha Technical Support at 1-800-52-ALPHA.

Note: Current ratings are intended as general guidelines for low-power electronic communications and control applications. Current ratings for power applications generally are set by regulatory agencies such as UL, CSA, NEC, and others.



Current Ratings	
No. of Conductors*	Factor
1	1.6
2 to 3	1.0
4 to 5	0.8
6 to 15	0.7
16 to 30	0.5

*Do not count shields unless used as conductor.

Signal Interference

When a particular installation is prone to EMI/RFI/ESI interference from either internal or external sources, some form of cable shielding will be required. The types of interference—or noise—cables are exposed to can determine the type of cable shielding required. There are basically four types of noise which will affect the wiring or cabling of an instrument or control circuit: static, magnetic, common mode, and crosstalk noise.

Static Noise

This refers to signal distortion due to the electrical field radiated by a voltage source, which has coupled into the signal-bearing circuit. Simple shielding of the full circuit is a typical means of mitigating this electrostatic type of interference. Foil shields, which offer 100% shielding efficiency, have proven most effective against this type of interference. It is critical that the shield be continued to, and completely encompass, the transmitting and receiving ends of the circuit if high levels of noise reduction are required. Effective grounding of the shield is also required; “floating” or non-grounded shields only partially reduce the effects of noise.

Magnetic Noise

Magnetic fields, radiated by power wiring found in large AC motors, transformers and knife switches, can set up current flows in opposition to the instrument circuit field. The result is the superimposing of a noise current on the signal current. The simplest and best means of mitigating the effects of such magnetic interference is by simple twisting of the cable elements.

Common Mode Noise

Common mode interference is the result of currents flowing between different potential grounds located at various points within a system. Receivers with very high common mode rejection ratios minimize this type of interference.

Crosstalk

This refers to the superimposing of either pulsed DC or standard AC signals carried on one wire pair to another wire pair in close proximity. Although pair twist tends to reduce crosstalk levels, the most effective means of mitigation is individual cable pair shielding coupled to pair twist.

Noise Levels

Once it has been determined that noise currents are going to pose a system problem, it becomes necessary to determine if the noise is of a low, medium or high level. The table below gives general guidelines as to the areas which are subject to these generalized noise levels:

Noise Level Chart

Noise Level Sources	Noise Sources	Typical Locations
High	Electrolytic processes Large motors, generators, transformers Induction heating Relay controls Power Lines	Heavy processing plants such as steel mills and foundries
Medium	Medium-size motors, generators, transformers Relay controls	Average manufacturing plants
Low	Small motors, generators, transformers	Storage areas, labs, offices and light assembly operations

Shielding

Shielding Performance

The shielding of electronic interconnect cables can play a critical role in overall system performance. System configuration, type of signals transmitted and proximity to noise generating sources all must be considered. These factors plus the type of interference, whether electromagnetic, electrostatic discharge (ESD) or radio frequency, will determine the necessity and type of shielding required. Alpha's Xtra-Guard cables are available in two shielded constructions providing protection for the majority of installation needs.

Shield Coverage: Braided Shield

The effectiveness of a braided shield depends upon the percent coverage afforded by the shield. Leakage in a braided shield is due to air spaces which exist between the weave. The following equation can be used to determine the percent coverage of a braided shield.

$$\tan a = \frac{2\pi (D + 2d)P}{C}$$

where

C = Number of carriers

D = Diameter under shield, inches

d = Diameter of one strand, inches

P = Picks per inch

a = Shield angle, degrees

K = Percent coverage, where

$$K = (2F - F^2) \times 100$$

and

$$F = \frac{NdP}{\sin a}$$

N = Number of strands per carrier

Shield Resistance

The D.C. resistance for braided shields can be calculated using the following equation:

$$R = \frac{dR}{\cos a (NC)}$$

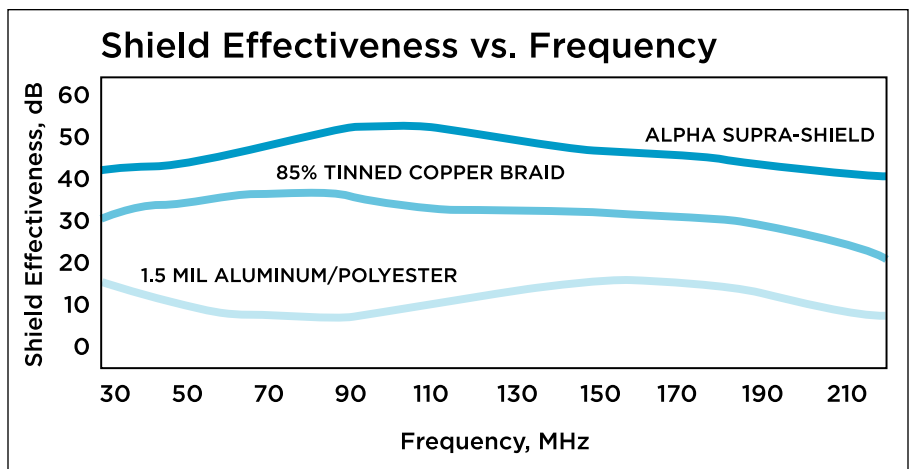
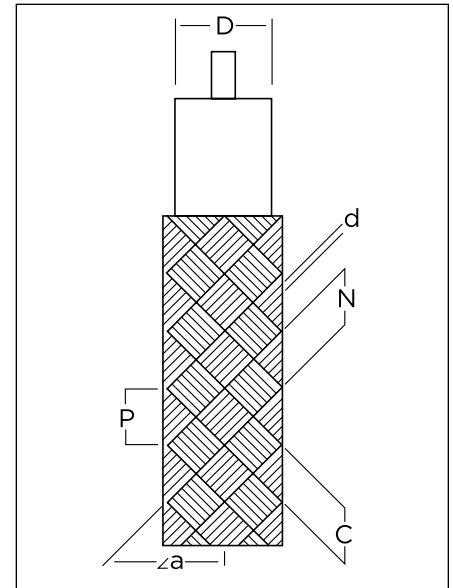
where

R = D.C. resistance, ohms/unit length

dR = D.C. resistance of 1 strand end, ohms/unit length

N = Number of strand ends in one carrier

C = Number of carriers

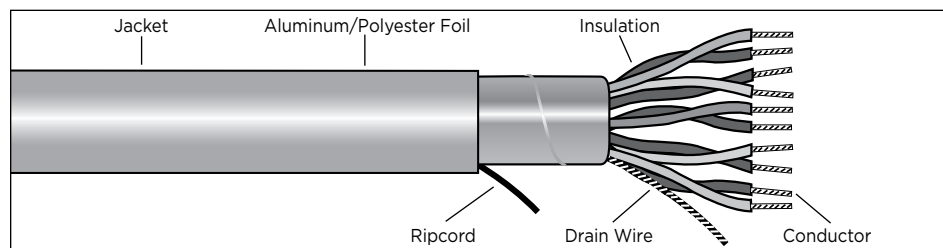


Xtra-Guard Shielding Options

Alpha Aluminum/Polyester Foil Shielding

- Lightweight shielding
- Low cost
- Ease of termination with use of stranded tinned copper drain wire
- High-frequency interference
- 100% coverage over the core of cable conductors

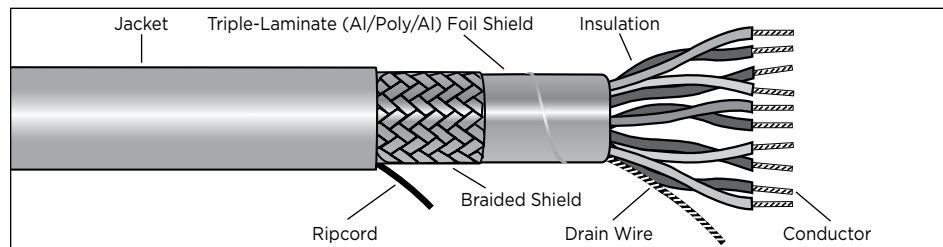
Alpha aluminum/polyester foil shielding consists of an aluminum polyester tape, foil side facing inward, with a 25% overlap and in contact with a stranded, tinned copper drain wire equal in size to insulated cable conductors.



Alpha Supra-Shield® (Foil/Braid) Shielding

- Ease of termination with use of stranded tinned copper drain wire
- High-frequency interference
- High physical strength

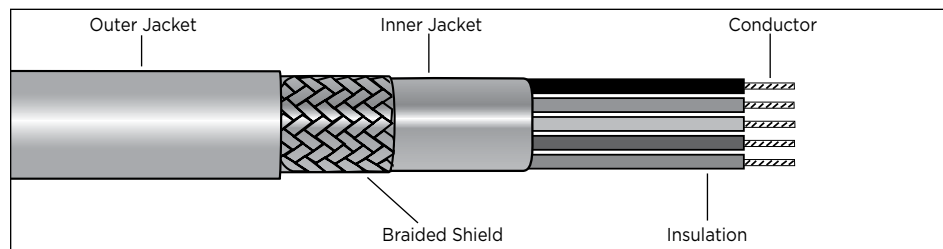
Alpha Supra-Shield® (foil/braid) shielding system consists of a unique triple-laminate tape. An aluminum/polyester/aluminum tape is bonded in one layer with a 25% overlap and in contact with a stranded tinned copper drain wire equal in size to the insulated cable conductors. A 70% coverage tinned copper braid shield is applied overall.



Xtra-Guard Flexible Cable Braid Shielding

- EMI/RFI resistance in power, control and data applications
- Continuous shield continuity in flexing applications
- High physical strength

Xtra-Guard flexible cables have specific shielding requirements resulting from the stresses of motion and flexing. Where foil shields will tear and lose continuity, Xtra-Guard flexible cables use a flexible, 85% coverage, tinned copper braid with a double jacket isolating the shield from the cable's inner core.

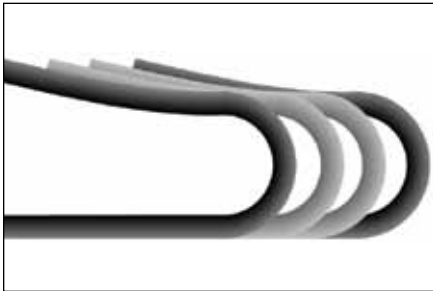


Common Flexing Applications

In applying a cable to a flexing application, you must consider the four types of flexing that may be encountered: Rolling Flex, Bending or Tic-Toc Flex, Torsional Flex, and Variable/Random Flex.

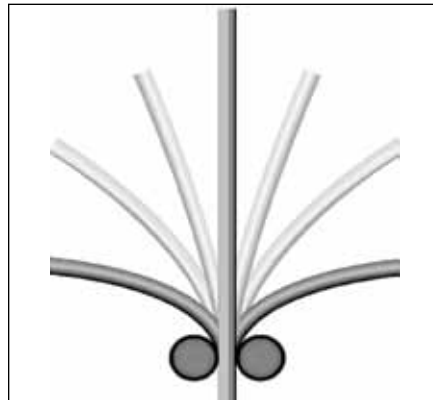
Rolling Flex

Rolling flex applications include linear motion associated with cable track systems or single axis slide apparatus. The most common type of rolling flex includes cable track systems where the cables are “managed” within an enclosed rolling motion carrier.



Bending Flex

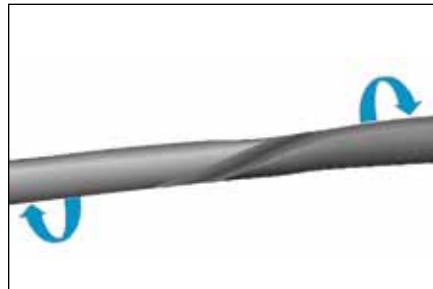
Bending or tick toc flex occurs when a cable is subjected to repetitive motion at a fixed point in the axis of the cable. The



bending moment of the cable is subjected to stress and fatigue from lateral motion in these applications.

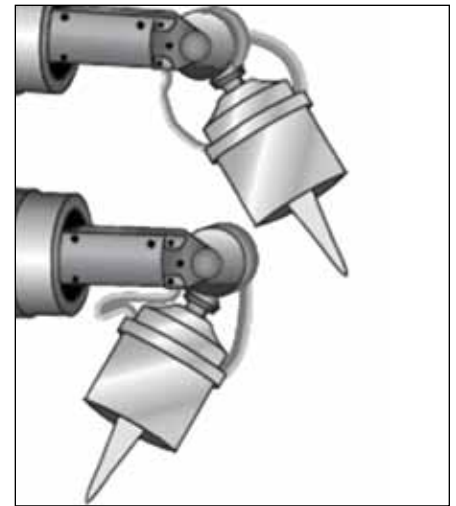
Torsional Flex

Torsional flexing applications occur when the cable is subjected to twisting forces, usually in a circular motion around the central axis of the cable. Robotic and pick/place apparatus are the most common applications subjecting cables to torsional stress.



Variable Flex

Variable flexing applications are random applications, which may occur in any number of flexing environments. Examples include articulation found in robotics, automated equipment, and hand-held devices.



Alpha Wire offers flexible cables products designed specifically for each of these types of flexure. In addition, Alpha’s engineering staff can assist the user in the design of application specific cables to suit specific needs, or in the specification of an existing Alpha Wire product. A close examination of the flex requirements is an important first step in selecting product.

Technical Data

Cable Flex Test Capabilities Matrix							
Flex Test Type	Applicable Standard	Travel Speed Or Cyclic Rate	Length Of Travel	Test Specimen	Bend Radius Or Mandrel Diameter	Sample Population	Acceptance Criteria
Rolling	Cable Track Alpha Rolling Flex	12.5 ft/s; 17 Cycles Per Minute	14 ft	28 ft	4.5" to 6.69"	1 Test Specimen Per Construction	Cycles to Failure
Bending/ Tic-Toc	MIL-C-13777G Section 3.7.2 and Section 4.5.4.1	30 Cycles Per Minute	42"@ ±90 degrees	42"	3/8" to 5/8"	3 Test Specimens Per Construction	Pass/Fail @ 1000 Cycles
Torsional	MIL-C-13777G Section 3.7.2 and Section 4.5.4.1	30 Cycles Per Minute	22"@ ±90 degrees	66"	3", 4.5", 6", 9"	3 Test Specimens Per Construction	Pass/Fail @ 3000 Cycles

Common Flexing Applications

Cable Family	Part No./Cable Description	Shield	Bend Radius	Cable Diameter	Bend Ratio: Radius/Diameter	Failure	Cycle Count	Test Status
Xtra-Guard Continuous Flex Control	85025 20 AWG x 25 Conductors	No	6.69	0.77	8.69:1	No	13,800,000	Complete
Xtra-Guard Continuous Flex Control	85807CY 18AWG x 7 Conductors	Yes	6.69	0.61	10.97:1	No	13,800,000	Test Complete
Xtra-Guard Continuous Flex Control	85618 16AWG x 18 Conductors	No	6.69	0.78	8.58:1	No	13,800,000	Test Complete
Xtra-Guard Continuous Flex Control	85404CY 14AWG x 4 Conductors	Yes	6.69	0.64	10.45:1	No	13,800,000	Test Complete
Xtra-Guard Continuous Flex Data	86714CY 22 AWG x 7 Pairs	Yes	4.5	0.51	8.82:1	No	14,500,000	Complete
Xtra-Guard Continuous Flex Data	86325CY 22 AWG x 25 Conductors	Yes	4.5	0.41	10.98:1	No	6,700,000	Complete
Series F	F16017RW 16 AWG x 17 Conductors	No	6.69	0.67	9.99:1	No	5,698,000	Complete
Series F	F16025RW 16 AWG x 25 Conductors	No	6.69	0.79	8.47:1	No	5,698,000	Complete
Series F	F16022RW 16 AWG x 22 Conductors	No	6.69	0.73	9.16:1	No	5,698,000	Complete
Series F	F16012RW 16 AWG x 12 Conductors	No	4.5	0.58	7.76:1	No	7,000,000	Complete
Series F	F16033RW 16 AWG x 33 Conductors	No	6.69	0.89	7.52:1	No	7,000,000	Complete
Series F	F16017RW 16 AWG x 17 Conductors	No	6.69	0.67	9.99:1	No	3,000,000	Complete
Series F	F16033RW 16 AWG x 33 Conductors	No	6.69	0.89	7.52:1	No	3,000,000	Complete
Series F	F16022RW 16 AWG x 22 Conductors	No	6.69	0.73	9.16:1	No	3,000,000	3,000,000
Series F	F08004KW 8 AWG x 4 Conductors	No	6.69	0.74	9.04:1	No	7,500,000	Track Failed
Series M	M16122RW 16 AWG x 22 Conductors	No	4.5	0.58	7.76:1	No	1,594,000	Complete
Series M	M16133RW 16 AWG x 33 Conductors	No	4.5	0.89	5.06:1	Yes	1,594,000	Complete

Agency Approvals

UL/NEC • cUL/CEC • CSA/CEC Classification

UL Standard 444/CSA C22.2: Multi-National Harmonized Communication Cable Standards CSA C22.2 No. 214-94 and UL 444.

UL (Underwriters Laboratories Inc.): Develops standards and test procedures for products, materials, components, assemblies, tool, and equipment. It mainly deals with product safety in the United States.

NEC (National Electrical Code): A United States standard for the safe installation of electrical wiring equipment.

AWM (Appliance Wiring Material): Intended for the internal wiring of factory-assembled products.

CSA (Canadian Standards Association International): Tests products for compliant to national and international standards and issues certification marks for qualified products

CEC (Canadian Electrical Code): A standard published by the CSA that pertains to the installation and maintenance of electrical equipment in Canada.

cUL: A notation indicating the UL has listed the product under the applicable CSA standard.

cRU: A notation indicating the UL has recognized the product under the applicable CSA standard.

CE (Conformité Européenne): A European Economic Community approval indicating that the product complies with LVD/73/23.

NEC Article 725 Types CL2, CL3, PLTC/CL3, (Class 2 & 3 cables)

Plenum	Riser	Commercial	Residential
CL2P	CL2R	CL2	CL2X*
CL3P	CL3R	CL3	CL3X*
(none)	(none)	PLTC*	(none)

NEC Article 760 Type FPL (Power-Limited, Fire Protective Signaling Circuit Cable)

Plenum	Riser	Commercial	Residential
FPLP	FPLR	FPL	(none)

NEC Article 800 Type CM (Communications)

Plenum	Riser	Commercial	Residential
CMP	CMR	CMG, CM	CMX*

NEC Article 336 Type TC (Tray Cable)

NEC Article 690 Type PV (Photovoltaic Wire)

NEC Article 820 Type CATV (Community Antenna Television and Radio Distribution System)

Plenum	Riser	Commercial	Residential
CATVP	CATVR	CATV	CATVX**

*Cable diameter must be less than 0.250" (6.35 mm)

**Cable diameter must be less than 0.375" (9.53 mm)

CSA International

CSA is a nonprofit, independent organization which operates a nationally recognized testing laboratory (NRTL) for electrical and electronic materials and equipment. Alpha Wire Company offers the following types of Canadian CSA certifications on a wide variety of both wire and cable products.

AWM (Appliance Wiring Material) is manufactured in accordance with CSA Standard C22.2 No. 210. These products are intended for the internal wiring of electrical and electronic equipment and interconnecting wiring between equipment. All of these wires and cables must pass one of the following flame tests in order to comply with CSA Certification requirements.

FT1 Vertical Flame Test per CSA C22.2 No. 3 specifies that finished cable shall not propagate a flame or continue to burn for more than one minute after five 15-second applications of the test flame. There is an interval of 15 seconds between flame applications.

FT4 Vertical Flame Test per CSA C22.2 No. 3 for cables in cable trays. This test is similar to, but more severe than, the UL Standard 1581 Vertical Tray flame test. The UL 1581 has its burner at 0° from the horizontal while the FT4 has its burner mounted at 20° from the horizontal with its burner parts facing up. The allowable char length is only 1.5 m (58"), while UL 1581 allows damage up to a maximum of 8 ft (2.4 m).

Agency Approvals

NEC Article 800 (Communications) UL/NEC – CSA/CEC Comparable Flame Test Designations

CMP CSA FT6/UL910 Horizontal Flame and Smoke Test 300,000 BTU

Horizontal flame and smoke test in accordance with ANSI/NFPA Standard 262-1985 (UL 910). The maximum flame spread shall be 1.50 m (58"). The smoke density shall be 0.5 at peak optical density and 0.15 at maximum average optical density. This test does not investigate toxicity, combustion, or decomposition.

CMR UL 1666 Vertical Flame Test 527,500 BTU

A large scale fire test for determining values of flame propagation height for electrical and optical-fiber cables that are intended for installation vertically in shafts. The flame propagation height is not to equal or exceed 12 ft (3.6 m). The temperature of any thermocouple at the 12 ft (3.5 m) height is not to exceed 850°F (454°C). The purpose of the test is to determine whether the flame propagation characteristics of these "riser" cables are in accordance with the NEC. This test does not investigate toxicity, combustion or decomposition.

CMG CSA FT4 Vertical Flame Test 70,000 BTU

This test is more stringent than the UL 1685/UL 1581 (Vertical Tray) in so much as the cable samples must be greater than 13 mm in diameter, if not the cables are grouped in bundles of at least three to obtain an overall group diameter of 13 mm. In addition, the burner is set at a 20° angle from the horizon with the burner ports facing up. This test has a maximum char height of 1.5 m (59") measured from the lower edge of the burner.

CM UL 1581 Section 1160 (Vertical Tray) Flame Test 2500 BTU

This test consist of an essentially flat metal plate burner mounted 0 degrees from the horizon. This test does not distinguish any specific cable size or diameter. This test has a maximum flame and char height of 78" measured from the burner.

CMX CSA FT-1/UL 1581 Section 1080 (VW-1) Vertical Flame Test 1700 BTU

A vertical finished cable shall not flame longer than 60 seconds following any of five 15 second applications of the specified nominal 125-mm premixed 500-W test flame (1700 BTU/hr.), the period between applications being (1) 15 seconds if the cable flaming ceases within 15 seconds or less time or (2) the duration of the cable flaming if the cable flame persists longer than 15 seconds. The cable shall not ignite combustible materials in the vicinity or damage more than 25% of the indicator flag during, between, or after the five applications of the test flame. The CSA FT-1 test is similar; however, it refers to CSA C22.2 No. 3, Paragraph 4.11.1 for flame test procedures.

The descriptions for the above flame tests are paraphrased from the applicable documents. For specific information, please consult the appropriate agency documentation.

Military Specifications

Military Specifications	
MIL-DTL-17	RG cables-polyethylene and PTFE cores.
MIL-W-76	General purpose hook-up wire for internal wiring of electronic equipment. Temperature range -40°C to +80°C vinyl, Types LW, MH, HW for service up to 2500 volts, polyethylene Type HF to 1000 volts.
MIL-W-3861	Copper conductors (uninsulated). Solid, bunches, concentric and rope constructions. Replaced by QQ-W-343 then superseded by A-A-59551.
MIL-DTL-16878	Military specification, covering unshielded wire for hook-up and lead wiring of electronic and electrical components and equipment. Formerly MIL-DTL-16878.
MIL-DTL-22759	PTFE insulated hook-up wire MIL-DTL-22759.
MIL-DTL-27500	600 volt aircraft wire with PTFE insulation. Formerly MIL-DTL-27500.
QQ-W-343	Copper conductors (uninsulated). Solid, bunches, concentric and rope constructions. Superseded by A-A-59551.
AMS-DTL-23053	General specification for heat shrinkable insulation sleeving. Formerly MIL-DTL-23053.
MIL-L-631	Non-rigid synthetic resin composition electrical insulation. May be in the form of film, sheets, tapes, or tubing.
MIL-I-3190	General specification for coated, flexible insulation sleeving.
A-A 59551	Wire, electrical, copper (uninsulated).
A-A 59569	Braid, wire (copper, tin-coated, silver-plated, or nickel coated, tubular or flat).
A-A 52080	Tape, lacing and tying, nylon.
A-A 52081	Tape, lacing and tying, polyester.
A-A-52083	Tape, lacing and tying, glass.
A-A-52084	Tape, lacing and tying, aramid.
A-A-59602	Tube, spiral wrap, polyethylene, PTFE and polyamide.
A-A-59301	Sleeving, textile, braided, synthetic polymer, -55°C to +105°C.
MIL-DTL-713	Twine, fibrous: impregnated, lacing and tying.
FED-STD-191	Textile test methods.
MIL-Y-1140	Yarn, cord, sleeving, cloth and tape-glass.
NEMA HP-3	PTFE insulated hook-up wire.

Military Cross Reference Index to Alpha Tubing and Sleeving Products

Heat-Shrink Tubing	
MIL-SPEC	Alpha Tubing Family
AMS-DTL-23053/1, CL 1,2	FIT- 600, ST-700
AMS-DTL-23053/2, CL 2, CL2 Except Longitudinal Shrinkage	Special Order
AMS-DTL-23053/4, CL 1, 2 & 3	FIT-300, FIT-750, FIT-321, ST-300, ST-302, ST-303
AMS-DTL-23053/5, CL , 2 & 3, CL1 Overexpanded	FIT-221, FIT-221B, FIT-221V, FIT-421, FIT-321V (except dimensions), FIT-421, ST-421
AMS-DTL-23053/6, CL 1 & 2	FIT-295
AMS-DTL-23053/8	FIT-350
AMS-DTL-23053/11, CL 1	FIT-400
AMS-DTL-23053/12, CL 3	FIT-500
AMS-DTL-23053/12, CL 5	Special Order
AMS-DTL-23053/13	FIT-650, ST-650
AMS-DTL-23053/18, CL	FIT-CLEAR
AMS-DTL-23053/15, CL1 & 2	SPC, SPCM

Extruded Tubing	
MIL-SPEC	Alpha Tubing Family
MIL-I-631D	PVC-105

Coated-Fiberglass Sleeving	
MIL-SPEC	Alpha Sleeving Family
MIL-I-3190/3 Type C	AF-155
MIL-I-3190/2 Type B	PIF-130
MIL-I-3190/2 Type B	MPF-130
MIL-I-3190/6 Type D	PIF-200
MIL-Y-1140	PIF-240

Spirally Cut Tubing	
MIL-SPEC	Part No.
A-A-59602, Type 1	SW-1 to SW-6
A-A-59602, Type 2	SW-20 to SW-25
A-A-59602, Type 3	SW-30 to SW-35
A-A-59602, Type 1	SW-40 to SW-45

Military Specifications

Military Cross Reference Index to Alpha Tubing and Sleeving Products

Expandable Self-Fitting Sleeving	
MIL-SPEC	Alpha Sleeving Family
A-A-59301	XS-200N

Lacing Cords and Tapes	
MIL-SPEC	Part No.
A-A-52080 Type 3, Finish C, FED STD 191	LC-132
A-A-52080 Type 4, Finish B, FED STD 191	LC-134
A-A-52080 Type 3, Finish B, FED STD 191	LC-136
A-A-52080 Type 3, Finish C, FED STD 191	LC-140
A-A-52080 Type 3, Finish E, FED STD 191	LC-143
A-A-52080 Type 5, Finish A, FED STD 191	801530
A-A-52080 Type 5, Finish B, FED STD 191	801536
A-A-52080 Type 4, Finish B, FED STD 191	802534
A-A-52080 Type 2, Finish C, FED STD 191	805032
A-A-52080 Type 3, Finish B, FED STD 191	805036
A-A-52080 Type 3, Finish C, FED STD 191	805040
A-A-52081 Type 3, Finish B, FED STD 191	LC-162
A-A-52081 Type 5, Finish C, FED STD 191	801566
A-A-52081 Type 4, Finish C, FED STD 191	802566
A-A-52081 Type 3, Finish C, FED STD 191	805058
A-A-52081 Type 3, Finish A, FED STD 191	805060
A-A-52081 Type 3, Finish B, FED STD 191	805062
A-A-52081 Type 3, Finish C, FED STD 191	805066
A-A-52083 Type 3, Finish G, FED STD 191	807510

FIT Heat-Shrink Tubing

Competitive Cross Reference

Competitive Cross Reference						
FIT Series	Sumitomo Electric	Tyco Electronics/ Raychem	3M	DSG-Canusa	Panduit	Insultab
105	F2	—	—	—	HSTTP	HS-105
221	A2, B2	RNF-100	FP-301	CPX 100	HSTT, HSTTM	HS-101
221B	A2, B2	RNF-100	FP-301	CPX 100	HSTT	HS-101
221V	B2	VERSAFIT 2:1	FP-301VW	CPX 876	HSTTV	HS-101
260	B2(Y/G)	DCPT	SFTW-202 GYS	CPX 201	—	—
295	BB	CRN	SR-350	CHM 140	—	HS-101SR
300	W5DL	SCL	MW	—	—	HS-101MV
321	W3B2	DWP-125	EPS-300	CPA 100	HSTTA	HS-101MV3:1
321V	B2(3X)	RNF-3000, VERSAFIT 3X	SFTW-303	CPX 300	—	HS-101-3X
350	K	RW-125	Kynar	DERAY KY 175	—	HSK-600
400	—	—	—	—	—	—
421	W3B2(4X)	RP-4800	EPS-400	—	SH277	HS-101MV4:1
500	—	—	—	—	—	—
600	R10	NT	NST	—	—	HSN-100
621	BCH(6X)	HRNF	—	—	—	—
650	FE3	VITON	VTN200	—	—	HS-VTN
700	—	SST	ITCS, HDT	CFW-D	—	—
750	O2B2	TAT-125	EPS-200	CPA 100	—	HS-101MV2:1
CLEAR	K2	RW-175	Kynar	DERAY KYF 190	—	—
CAP	—	101 A0xx	—	—	—	—
CRIMP	—	D406	MH18, MH14, MH10	—	—	—
FABRIC	—	HFT5000	—	—	—	—
FLEX	—	SRFR	—	—	—	—
SLV	—	SO1xx-R/ SO2-xx-R	—	—	—	—

Xtra-Guard Flex Cables

Competitive Cross Reference

Lapp to Alpha							
Lapp	Alpha	Lapp	Alpha	Lapp	Alpha	Lapp	Alpha
28110	87007	601604CY	65604CY	602204TP	86704CY	602625	86125
28160	87304	601605	65605	602205	86305	602625S	86125CY
28171	87403	601605CY	65605CY	602205TP	86705CY	602802	86002
28172	87404	601607	65607	602206TP	86706CY	602802S	86002CY
28174	87407	601607CY	65607CY	602207	86307	602803	86003
28181	87503	601609	65609	602208TP	86708CY	602803S	86003CY
28182	87504	601612	65612	602210TP	86710CY	602804	86004
28184	87603	601612CY	65612CY	602214TP	86714CY	602804S	86004CY
600204	65304	601618	65618	602225	86325	602805	86005
600204CY	65304CY	601618CY	65618CY	602401TP	86601CY	602805S	86005CY
600205	65305	601625	65625	602402	86202	602807	86007
600404	65504	601625CY	65625CY	602402S	86202CY	602807S	86007CY
600405	65505	601641	65641	602402TP	86602CY	602812S	86012CY
600604	65704	601650	65650	602403	86203	602818S	86018CY
600604CY	65704CY	601802	65802	602403S	86203CY	602825	86025
600605	65705	601803	65803	602403TP	86603CY	602825S	86025CY
600804	65904	601803CY	65803CY	602404	86204	811442	87003
600804CY	65904CY	601804	65804	602404S	86204CY	811443	87004
600805	65905	601804CY	65804CY	602404TP	86604CY	890204	85304
601003	65103	601805	65805	602405	86205	890204CY	85304CY
601003CY	65103CY	601805CY	65805CY	602405S	86205CY	890404	85504
601004	65104	601807	65807	602405TP	86605CY	890404CY	85504CY
601004CY	65104CY	601807CY	65807CY	602406TP	86606CY	890604	85704
601005	65105	601809	65809	602407	86207	890604CY	85704CY
601005CY	65105CY	601812	65812	602407S	86207CY	890804	85904
601007CY	65107CY	601812CY	65812CY	602408TP	86608CY	890804CY	85904CY
601203	65203	601818	65818	602410TP	86610CY	891004	85104
601203CY	65203CY	601818CY	65818CY	602412S	86212CY	891004CY	85104CY
601204	65204	601825	65825	602414TP	86614CY	891007	85107
601204CY	65204CY	601825CY	65825CY	602418S	86218CY	891007CY	85107CY
601205	65205	601834	65834	602425	86225	891204	85204
601205CY	65205CY	601841	65841	602425S	86225CY	891204CY	85204CY
601207	65207	601850	65850	602601TP	86501CY	891207	85207
601402	65402	602002	65002	602602	86102	891207CY	85207CY
601403	65403	602003	65003	602602S	86102CY	891404	85404
601403CY	65403CY	602003CY	65003CY	602602TP	86502CY	891404CY	85404CY
601404	65404	602004	65004	602603	86103	891407	85407
601404CY	65404CY	602005	65005	602603S	86103CY	891407CY	85407CY
601405	65405	602007	65007	602603TP	86503CY	891603	85603
601405CY	65405CY	602007CY	65007CY	602604	86104	891603CY	85603CY
601407	65407	602009	65009	602604S	86104CY	891604	85604
601407CY	65407CY	602012	65012	602604TP	86504CY	891604CY	85604CY
601409	65409	602012CY	65012CY	602605	86105	891605	85605
601412	65412	602018	65018	602605S	86105CY	891605CY	85605CY
601412CY	65412CY	602025	65025	602605TP	86505CY	891607	85607
601418	65418	602025CY	65025CY	602606TP	86506CY	891607CY	85607CY
601418CY	65418CY	602201TP	86701CY	602607	86107	891612	85612
601425	65425	602202	86302	602607S	86107CY	891612CY	85612CY
601602	65602	602202TP	86702CY	602608TP	86508CY	891618	85618
601603	65603	602203	86303	602610TP	86510CY	891618CY	85618CY
601603CY	65603CY	602203TP	86703CY	602612S	86112CY	891625	85625
601604	65604	602204	86304	602618S	86118CY	891625CY	85625CY

Xtra-Guard Flex Cables

Competitive Cross Reference

Lapp to Alpha							
Lapp	Alpha	Lapp	Alpha	Lapp	Alpha	Lapp	Alpha
891634	85634	891807	85807	891834	85834	892010CY	85010CY
891634CY	85634CY	891807CY	85807CY	892003	85003	892012	85012
891650	85650	891812	85812	892003CY	85003CY	892012CY	85012CY
891803	85803	891812CY	85812CY	892004	85004	892018	85018
891803CY	85803CY	891815	85815	892004CY	85004CY	892018CY	85018CY
891804	85804	891818	85818	892005	85005	892025	85025
891804CY	85804CY	891818CY	85818CY	892005CY	85005CY	892025CY	85025CY
891805	85805	891825	85825	892007	85007	892034	85034
891805CY	85805CY	891825CY	85825CY	892007CY	85007CY		

HELUKABEL	Alpha	HELUKABEL	Alpha	HELUKABEL	Alpha	HELUKABEL	Alpha
10001	65002	10142	65204	15077	85407	18031	86204
10002	65003	10143	65205	15143	85204	18032	86205
10004	65004	10144	65207	15145	85104	18034	86207
10006	65005	10147	65103	15147	85904	18037	86212
10009	65007	10148	65104	15149	85704	18040	86218
10013	65012	10149	65105	15151	85634CY	18057	86302
10016	65018	10152	65904	15160	85904CY	18058	86303
10019	65025	10153	65905	15162	85704CY	18059	86304
10030	65802	10155	65704	15926	85404CY	18060	86305
10031	65803	10156	65705	15928	85407CY	18062	86307
10033	65804	10158	65504	15931	85003CY	18065	86312
10035	65805	10159	65505	15932	85004CY	18068	86318
10038	65807	10161	65304	15933	85005CY	18096	86325
10041	65809	10162	65305	15934	85007CY	18117	86125
10043	65812	15002	85003	15935	85012CY	18118	86225
10047	65818	15003	85004	15936	85018CY	20001	86102CY
10050	65825	15004	85005	15938	85025CY	20002	86103CY
10052	65834	15005	85007	15946	85803CY	20003	86104CY
10054	65841	15007	85012	15947	85804CY	20004	86105CY
10056	65850	15010	85018	15948	85805CY	20006	86107CY
10090	65602	15012	85025	15949	85807CY	20009	86112CY
10091	65603	15014	85034	15950	85812CY	20012	86118CY
10093	65604	15020	85803	15951	85818CY	20029	86202CY
10095	65605	15021	85804	15952	85825CY	20030	86203CY
10098	65607	15022	85805	15977	85603CY	20031	86204CY
10101	65609	15023	85807	15978	85604CY	20032	86205CY
10103	65612	15025	85812	15979	85605CY	20033	86207CY
10107	65618	15028	85818	15980	85607CY	20036	86212CY
10110	65625	15030	85825	15981	85612CY	20039	86218CY
10113	65641	15032	85834	15982	85618CY	20091	86125CY
10115	65650	15056	85603	15983	85625CY	20092	86225CY
10120	65402	15057	85604	18001	86102	83774	86501CY
10121	65403	15058	85605	18002	86103	83775	86502CY
10123	65404	15059	85607	18003	86104	83776	86503CY
10125	65405	15061	85612	18004	86105	83777	86504CY
10127	65407	15064	85618	18006	86107	83778	86505CY
10130	65412	15066	85625	18009	86112	83779	86506CY
10132	65418	15068	85634	18012	86118	83781	86508CY
10134	65425	15071	85650	18029	86202	83782	86510CY
10141	65203	15075	85404	18030	86203	83784	86514CY

Xtra-Guard Flex Cables

Competitive Cross Reference

HELUKABEL to Alpha							
HELUKABEL	Alpha	HELUKABEL	Alpha	HELUKABEL	Alpha	HELUKABEL	Alpha
83792	86601CY	83797	86606CY	83811	86702CY	83817	86708CY
83793	86602CY	83799	86608CY	83812	86703CY	83818	86710CY
83794	86603CY	83800	86610CY	83813	86704CY	83820	86714CY
83795	86604CY	83802	86614CY	83814	86705CY		
83796	86605CY	83810	86701CY	83815	86706CY		

Igus to Alpha							
Igus	Alpha	Igus	Alpha	Igus	Alpha	Igus	Alpha
CF130-05-02	65002	CF140-07-05	65805CY	CF240-01-04	86104CY	CF5-15-07	85607
CF130-05-03	65003	CF140-07-07	65807CY	CF240-01-05	86105CY	CF5-15-12	85612
CF130-05-04	65004	CF140-07-12	65812CY	CF240-01-07	86107CY	CF5-15-18	85618
CF130-05-05	65005	CF140-07-18	65818CY	CF240-01-18	86118CY	CF5-15-25	85625
CF130-05-07	65007	CF140-07-25	65825CY	CF240-02-03	86203CY	CF5-25-04	85404
CF130-07-04	65804	CF140-15-03	65603CY	CF240-02-04	86204CY	CF5-25-07	85407
CF130-07-05	65805	CF140-15-04	65604CY	CF240-02-05	86205CY	CF6-05-05	85005CY
CF130-07-07	65807	CF140-15-05	65605CY	CF240-02-07	86207CY	CF6-05-12	85012CY
CF130-07-12	65812	CF140-15-07	65607CY	CF240-02-18	86218CY	CF6-05-18	85018CY
CF130-07-18	65818	CF140-15-12	65612CY	CF5-05-03	85003	CF6-07-03	85803CY
CF130-07-25	65825	CF140-15-18	65618CY	CF5-05-07	85007	CF6-07-04	85804CY
CF130-15-03	65603	CF140-15-25	65625CY	CF5-05-12	85012	CF6-07-05	85805CY
CF130-15-04	65604	CF140-25-04	65404CY	CF5-05-18	85018	CF6-07-07	85807CY
CF130-15-05	65605	CF211-02-01-02	86601CY	CF5-05-25	85025	CF6-07-12	85812CY
CF130-15-07	65607	CF211-02-02-02	86602CY	CF5-07-04	85804	CF6-07-18	85818CY
CF130-15-12	65612	CF211-02-03-02	86603CY	CF5-07-05	85805	CF6-15-03	85603CY
CF130-15-18	65618	CF211-02-04-02	86604CY	CF5-07-07	85807	CF6-15-04	85604CY
CF130-15-25	65625	CF211-02-05-02	86605CY	CF5-07-12	85812	CF6-15-05	85605CY
CF130-25-04	65404	CF211-02-06-02	86606CY	CF5-07-18	85818	CF6-15-07	85607CY
CF130-25-07	65407	CF211-02-08-02	86608CY	CF5-07-25	85825	CF6-15-12	85612CY
CF130-25-12	65412	CF211-02-10-02	86610CY	CF5-15-03	85603	CF6-15-18	85618CY
CF140-07-03	65803CY	CF211-02-14-02	86614CY	CF5-15-04	85604	CF6-15-25	85625CY
CF140-07-04	65804CY	CF240-01-03	86103CY	CF5-15-05	85605	CF6-25-04	85404CY

Lutze to Alpha							
Lutze	Alpha	Lutze	Alpha	Lutze	Alpha	Lutze	Alpha
100154	85207	100431	65604	100467	65103	100794	85618
100215	65007	100432	65605	100468	65104	100795	85625
100354	65705	100433	65607	100471	65904	100796	85603
100358	65025	100437	65612	100473	65704	100797	85407
100363	65002	100440	65618	100475	65905	100808	85605
100364	65003	100443	65625	100480	65504	100998	85812
100365	65004	100447	65650	100481	65304	101049	85003
100366	65005	100453	65403	100707	85404	101050	85104
100370	65012	100454	65404	100766	85803	101351	85010CY
100373	65018	100455	65405	100767	85805	108003	85404CY
100385	65803	100456	65407	100768	85807	108019	85107
100386	65804	100458	65412	100771	85834	108049	85204
100392	65812	100460	65418	100780	85650	108055	85018CY
100398	65825	100461	65425	100782	85818	110016	86102CY
100400	65834	100464	65204	100784	85825	110017	86103CY
100421	65850	100465	65105	100787	85604	110018	86104CY
100429	65602	100465	65205	100792	85607	110019	86105CY
100430	65603	100466	65207	100793	85612	110021	86107CY

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Lutze to Alpha							
Lutze	Alpha	Lutze	Alpha	Lutze	Alpha	Lutze	Alpha
110023	86112CY	110601	86503CY	111245	85805CY	116135	65407CY
110026	86118CY	110602	86504CY	111303	85607CY	116150	65204CY
110090	86203CY	110604	86506CY	111304	85612CY	116153	65104CY
110091	86204CY	110606	86510CY	111305	85618CY	118039	85005CY
110092	86205CY	110618	86602CY	111306	85625CY	118111	85204CY
110096	86212CY	110619	86603CY	116100	65803CY	118112	85104CY
110099	86218CY	110620	86604CY	116102	65804CY	118194	85605CY
110387	65805	110622	86606CY	116103	65805CY	118195	86605CY
110389	65807	110633	86702CY	116104	65807CY	118251	86608CY
110395	65818	110634	86703CY	116105	65812CY	118383	85004
110411	86207CY	110635	86704CY	116106	65818CY	118384	85007
110423	85004CY	110637	86706CY	116107	65825CY	118389	65402
110441	85803CY	110665	86710CY	116121	65603CY	119132	85818CY
110447	85012	110774	85003CY	116123	65604CY	A1032202	86302
110447	85012CY	110775	85007CY	116124	65605CY	A1032203	86303
110486	85825CY	110776	85025	116125	65607CY	A1032204	86304
110490	85807CY	110776	85025CY	116126	65612CY	A1032225	86325
110491	85812CY	110908	86202CY	116127	65618CY	A1032402	86202
110499	85604CY	110954	85603CY	116128	65625CY	A1032403	86203
110566	85804CY	111045	85804	116132	65403CY	A1032404	86204
110591	85018	111047	86125CY	116133	65404CY	A1032425	86225
110600	86502CY	111049	86225CY	116134	65405CY		

SAB	Alpha	SAB	Alpha	SAB	Alpha	SAB	Alpha
02040204	65304	02041612	65612	02591003	65103CY	02592007	65007CY
02040404	65504	02041618	65618	02591004	65104CY	02592012	65012CY
02040604	65704	02041625	65625	02591005	65105CY	02592025	65025CY
02040804	65904	02041641	65641	02591203	65203CY	07750204	85304
02040805	65905	02041802	65802	02591204	65204CY	07750404	85504
02041003	65103	02041803	65803	02591205	65205CY	07750604	85704
02041004	65104	02041804	65804	02591403	65403CY	07750804	85904
02041005	65105	02041805	65805	02591404	65404CY	07751004	85104
02041203	65203	02041807	65807	02591405	65405CY	07751007	85107
02041204	65204	02041809	65809	02591407	65407CY	07751204	85204
02041205	65205	02041812	65812	02591412	65412CY	07751207	85207
02041207	65207	02041818	65818	02591418	65418CY	07751404	85404
02041402	65402	02041825	65825	02591603	65603CY	07751407	85407
02041403	65403	02041834	65834	02591604	65604CY	07751603	85603
02041404	65404	02041841	65841	02591605	65605CY	07751604	85604
02041405	65405	02042002	65002	02591607	65607CY	07751605	85605
02041407	65407	02042003	65003	02591612	65612CY	07751607	85607
02041409	65409	02042004	65004	02591618	65618CY	07751612	85612
02041412	65412	02042005	65005	02591625	65625CY	07751618	85618
02041418	65418	02042007	65007	02591803	65803CY	07751625	85625
02041425	65425	02042009	65009	02591804	65804CY	07751634	85634
02041602	65602	02042012	65012	02591805	65805CY	07751650	85650
02041603	65603	02042018	65018	02591807	65807CY	07751803	85803
02041604	65604	02042025	65025	02591812	65812CY	07751804	85804
02041605	65605	02590204	65304CY	02591818	65818CY	07751805	85805
02041607	65607	02590604	65704CY	02591825	65825CY	07751807	85807
02041609	65609	02590804	65904CY	02592003	65003CY	07751812	85812

Xtra-Guard Flex Cables

Competitive Cross Reference

SAB to Alpha							
SAB	Alpha	SAB	Alpha	SAB	Alpha	SAB	Alpha
07751815	85815	07850404	85504CY	07851612	85612CY	07852007	85007CY
07751818	85818	07850604	85704CY	07851618	85618CY	07852010	85010CY
07751825	85825	07850804	85904CY	07851625	85625CY	07852012	85012CY
07751834	85834	07851004	85104CY	07851803	85803CY	07852018	85018CY
07752003	85003	07851007	85107CY	07851804	85804CY	07852025	85025CY
07752004	85004	07851204	85204CY	07851805	85805CY	07951203	87603
07752005	85005	07851207	85207CY	07851807	85807CY	07951403	87503
07752007	85007	07851404	85404CY	07851812	85812CY	07951404	87504
07752012	85012	07851407	85407CY	07851818	85818CY	07951603	87403
07752018	85018	07851603	85603CY	07851825	85825CY	07951604	87404
07752025	85025	07851604	85604CY	07852003	85003CY	07951607	87407
07752034	85034	07851605	85605CY	07852004	85004CY	07951804	87304
07850204	85304CY	07851607	85607CY	07852005	85005CY	07952407	87007

Belden to Alpha							
Belden	Alpha	Belden	Alpha	Belden	Alpha	Belden	Alpha
7101A	85003	7122A	85603	7408A	65025	7427AS	65612CY
7101AS	85003CY	7122AS	85603CY	7408AS	65025CY	7428A	65618
7102A	85004	7123A	85604	7409A	65802	7428AS	65618CY
7102AS	85004CY	7123AS	85604CY	7410A	65803	7429A	65625
7103A	85005	7123AS	85825CY	7410AS	65803CY	7429AS	65625CY
7103AS	85005CY	7124A	85605	7411A	65804	7431A	65641
7104A	85007	7124AS	85605CY	7411AS	65804CY	7434A	65402
7104AS	85007CY	7125A	85607	7412A	65805	7435A	65403
7106A	85012	7125AS	85607CY	7412AS	65805CY	7435AS	65403CY
7106AS	85012CY	7127AS	85812CY	7413A	65807	7436A	65404
7107A	85018	7128AS	85818CY	7413AS	65807CY	7436AS	65404CY
7107AS	85018CY	7136A	85404	7414A	65809	7437A	65405
7108A	85025	7136AS	85404CY	7415A	65812	7437AS	65405CY
7108AS	85025CY	7137A	85407	7415AS	65812CY	7438A	65407
7110A	85803	7137AS	85407CY	7416A	65818	7438AS	65407CY
7110AS	85803CY	7145A	85204	7416AS	65818CY	7439A	65409
7111A	85804	7145AS	85204CY	7417A	65825	7440A	65412
7111AS	85804CY	7146A	85207	7417AS	65825CY	7441A	65418
7112A	85805	7146AS	85207CY	7418A	65834	7442A	65425
7112AS	85805CY	7147A	85104	7419A	65841	7444A	65203
7113A	85807	7174AS	85104CY	7420A	65850	7444AS	65203CY
7113AS	85807CY	7400A	65002	7421A	65602	7445A	65204
7115A	85612	7401A	65003	7422A	65603	7445AS	65204CY
7115AS	85612CY	7401AS	65003CY	7422AS	65603CY	7446A	65103
7116A	85618	7402A	65004	7423A	65604	7446AS	65103CY
7116AS	85618CY	7403A	65005	7423AS	65604CY	7447A	65104
7117A	85625	7404A	65007	7424A	65605	7447AS	65104CY
7117AS	85625CY	7404AS	65007CY	7424AS	65605CY	7448A	65105
7118A	85634	7405A	65009	7425A	65607	7448AS	65105CY
		7406A	65012	7425AS	65607CY	7461A	65205
		7406AS	65012CY	7426A	65609	7461AS	65205CY
		7407A	65018	7427A	65612		

Lapp to Alpha Wire Series XM

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Part No.	Part No.	Page No.	Part No.	Part No.	Page No.	Part No.	Part No.	Page No.
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891804	XM1804R	136	891605CY	XM1605RCY	138	891405	XM1405L	136
891805	XM1805R	136	891607CY	XM1607RCY	138	891407	XM1407L	136
891807	XM1807R	136	891612CY	XM1612RCY	138	891412	XM1412L	136
891812	XM1812R	136	891617CY	XM1617RCY	138	891203	XM1203L	137
891817	XM1817R	136	891619CY	XM1619RCY	138	891204	XM1204L	137
891822	XM1822R	136	891622CY	XM1622RCY	138	891205	XM1205L	137
891825	XM1825R	136	891625CY	XM1625RCY	138	891207	XM1207L	137
891834	XM1834R	136	891633CY	XM1633RCY	138	891003	XM1003L	137
891842	XM1842R	136	891642CY	XM1642RCY	138	891004	XM1004L	137
891849	XM1849R	136	891649CY	XM1649RCY	138	891005	XM1005L	137
891865	XM1865R	136	891403CY	XM1403RCY	138	891007	XM1007L	137
891603	XM1603R	136	891404CY	XM1404RCY	138	890803	XM0803L	137
891604	XM1604R	136	891405CY	XM1405RCY	138	890804	XM0804L	137
891605	XM1605R	136	891407CY	XM1407RCY	138	891803CY	XM1803LCY	138
891607	XM1607R	136	891412CY	XM1412RCY	138	891804CY	XM1804LCY	138
891612	XM1612R	136	891203CY	XM1203RCY	139	891805CY	XM1805LCY	138
891617	XM1617R	136	891204CY	XM1204RCY	139	891807CY	XM1807LCY	138
891619	XM1619R	136	891205CY	XM1205RCY	139	891812CY	XM1812LCY	138
891622	XM1622R	136	891207CY	XM1207RCY	139	891817CY	XM1817LCY	138
891625	XM1625R	136	891003CY	XM1003RCY	139	891822CY	XM1822LCY	138
891633	XM1633R	136	891004CY	XM1004RCY	139	891825CY	XM1825LCY	138
891642	XM1642R	136	891005CY	XM1005RCY	139	891834CY	XM1834LCY	138
891649	XM1649R	136	891007CY	XM1007RCY	139	891842CY	XM1842LCY	138
891665	XM1665R	136	890803CY	XM0803RCY	139	891849CY	XM1849LCY	138
891403	XM1403R	136	890804CY	XM0804RCY	139	891603CY	XM1603LCY	138
891404	XM1404R	136	891803	XM1803L	136	891604CY	XM1604LCY	138
891405	XM1405R	136	891804	XM1804L	136	891605CY	XM1605LCY	138
891407	XM1407R	136	891805	XM1805L	136	891607CY	XM1607LCY	138
891412	XM1412R	136	891807	XM1807L	136	891612CY	XM1612LCY	138
891203	XM1203R	137	891812	XM1812L	136	891617CY	XM1617LCY	138
891204	XM1204R	137	891817	XM1817L	136	891619CY	XM1619LCY	138
891205	XM1205R	137	891822	XM1822L	136	891622CY	XM1622LCY	138
891207	XM1207R	137	891825	XM1825L	136	891625CY	XM1625LCY	138
891003	XM1003R	137	891834	XM1834L	136	891633CY	XM1633LCY	138
891004	XM1004R	137	891842	XM1842L	136	891642CY	XM1642LCY	138
891005	XM1005R	137	891849	XM1849L	136	891649CY	XM1649LCY	138
891007	XM1007R	137	891865	XM1865L	136	891403CY	XM1403LCY	138
890803	XM0803R	137	891603	XM1603L	136	891404CY	XM1404LCY	138
890804	XM0804R	137	891604	XM1604L	136	891405CY	XM1405LCY	138
891803CY	XM1803RCY	138	891605	XM1605L	136	891407CY	XM1407LCY	138
891804CY	XM1804RCY	138	891607	XM1607L	136	891412CY	XM1412LCY	138
891805CY	XM1805RCY	138	891612	XM1612L	136	891203CY	XM1203LCY	139
891807CY	XM1807RCY	138	891617	XM1617L	136	891204CY	XM1204LCY	139
891812CY	XM1812RCY	138	891619	XM1619L	136	891205CY	XM1205LCY	139
891817CY	XM1817RCY	138	891622	XM1622L	136	891207CY	XM1207LCY	139
891822CY	XM1822RCY	138	891625	XM1625L	136	891003CY	XM1003LCY	139
891825CY	XM1825RCY	138	891633	XM1633L	136	891004CY	XM1004LCY	139
891834CY	XM1834RCY	138	891642	XM1642L	136	891005CY	XM1005LCY	139
891842CY	XM1842RCY	138	891649	XM1649L	136	891007CY	XM1007LCY	139
891849CY	XM1849RCY	138	891665	XM1665L	136	890803CY	XM0803LCY	139
891603CY	XM1603RCY	138	891403	XM1403L	136	890804CY	XM0804LCY	139

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891807	XM1807K	136	891612CY	XM1612KCY	138
891812	XM1812K	136	891617CY	XM1617KCY	138
891817	XM1817K	136	891619CY	XM1619KCY	138
891822	XM1822K	136	891622CY	XM1622KCY	138
891825	XM1825K	136	891625CY	XM1625KCY	138
891834	XM1834K	136	891633CY	XM1633KCY	138
891842	XM1842K	136	891642CY	XM1642KCY	138
891849	XM1849K	136	891649CY	XM1649KCY	138
891865	XM1865K	136	891403CY	XM1403KCY	138
891603	XM1603K	136	891404CY	XM1404KCY	138
891604	XM1604K	136	891405CY	XM1405KCY	138
891605	XM1605K	136	891407CY	XM1407KCY	138
891607	XM1607K	136	891412CY	XM1412KCY	138
891612	XM1612K	136	891203CY	XM1203KCY	139
891617	XM1617K	136	891204CY	XM1204KCY	139
891619	XM1619K	136	891205CY	XM1205KCY	139
891622	XM1622K	136	891207CY	XM1207KCY	139
891625	XM1625K	136	891003CY	XM1003KCY	139
891633	XM1633K	136	891004CY	XM1004KCY	139
891642	XM1642K	136	891005CY	XM1005KCY	139
891649	XM1649K	136	891007CY	XM1007KCY	139
891665	XM1665K	136	890803CY	XM0803KCY	139
891403	XM1403K	136	890804CY	XM0804KCY	139
891404	XM1404K	136			
891405	XM1405K	136			
891407	XM1407K	136			
891412	XM1412K	136			
891203	XM1203K	137			
891204	XM1204K	137			
891205	XM1205K	137			
891207	XM1207K	137			
891003	XM1003K	137			
891004	XM1004K	137			
891005	XM1005K	137			
891007	XM1007K	137			
890803	XM0803K	137			
890804	XM0804K	137			
891803CY	XM1803KCY	138			
891804CY	XM1804KCY	138			
891805CY	XM1805KCY	138			
891807CY	XM1807KCY	138			
891812CY	XM1812KCY	138			
891817CY	XM1817KCY	138			
891822CY	XM1822KCY	138			
891825CY	XM1825KCY	138			
891834CY	XM1834KCY	138			
891842CY	XM1842KCY	138			
891849CY	XM1849KCY	138			
891603CY	XM1603KCY	138			

Belden to Alpha Wire

Cross Reference

Belden			Alpha Wire			Belden			Alpha Wire		
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1021A	5712/2024	290	8107	6227C	355	8340	6368	351			
1022A	5712/2036	290	8108	6228C	355	8342	6369	351			
1083A	5650B2004	211	8110	6230C	355	8345	6370	351			
1084A	5650B2008	211	8112	6230/12C	355	8348	6371	351			
1091A	5620B2020	215	8115	6230/15C	355	8355	6372	351			
1102A	5711/2004	290	8118	6230/18C	355	8403	1713	329			
1103A	5712/2008	290	8125	6230/25C	355	8404	1715	329			
1104A	5713/2004	290	8132	3492C	354	8405	1716	329			
1106A	5713/2012	290	8133	3493C	354	8407	1451/16	330			
1107A	5713/2024	290	8134	3494C	354	8408	1450/16	330			
1192A	1772	328	8135	3495C	354	8411	1703	327			
1419A	6202C	347	8138	3498C	354	8422	1710	327			
1420A	6203C	347	8142	3500/12C	354	8430	1115	368			
1421A	6204C	347	8148	3500/18C	354	8434	2468	349			
1422A	6205C	347	8153	3500/25C	354	8437	1775C	323			
1423A	6206C	347	8155	3500/25C	354	8441	1736C	323			
1424A	6210/12C	347	8162	6316	362	8442	1172C	308			
1425A	6210/15C	347	8163	6317	362	8443	1173C	308			
7307A	87303	119	8164	6318	362	8444	1174C	308			
7308A	87304	119	8165	6319	362	8445	1175C	308			
7310A	87307	119	8166	6320	362	8446	1826C	313			
7320A	87203	119	8167	6321	362	8448	1828C	313			
7321A	87204	119	8168	6322	362	8450	2460C	316			
7322A	87207	119	8170	6323	362	8451	2461C	316			
7328A	87403	120	8175	6324	362	8453	1951/3	273			
7329A	87404	120	8178	6325	362	8456	1180C	308			
7330A	87407	120	8185	6326	362	8457	1181C	308			
7332A	87503	120	8205	1895C	309	8458	1181/15C	308			
7333A	87504	120	8227	9817	246	8459	1181/25C	308			
7334A	87507	120	8241	9059C	250	8465	1898/5C	309			
7336A	87603	120	8259	9058AC	238	8466	1898/12C	309			
7337A	87604	120	8262	9058C	238	8467	1898/7C	309			
7338A	87607	120	8263	9059B	250	8468	1898/15C	309			
7339A	87703	120	8302	6373	351	8469	1898/9C	306			
7340A	87704	120	8303	6374	351	8471	1899C	309			
7341A	87705	120	8304	6375	351	8484	1896/4C	309			
8011	289	422	8305	6376	351	8489	1898/4C	309			
8012	286	422	8306	6377	351	8500	1858/19	309			
8013	295	422	8307	6378	351	8501	1857	309			
8019	296	422	8308	6379	351	8502	1856	384			
8020	297	422	8310	6380	351	8503	1855	384			
8021	298	422	8312	6381	351	8504	1854	384			
8022	299	422	8315	6382	351	8505	1853	384			
8023	299/1	422	8318	6383	351	8520	1559	390			
8024	299/2	422	8325	6384	351	8521	1557	390			
8025	299/3	422	8332	6362	351	8522	1555	390			
8102	6222C	355	8333	6363	351	8523	1553	390			
8103	6223C	355	8334	6364	351	8524	1551	390			
8104	6224C	355	8335	6365	351	8525	1550	390			

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8622	1072	311	8775	6016C	357	9430	1177C	308
8623	1075	311	8776	6018C	357	9431	1181/20C	308
8624	1079	311	8777	6010C	357	9432	1181/30C	308
8627	1274	311	8778	6012C	357	9433	1181/40C	308
8628	1277	311	8780	2260	319	9434	1181/50C	308
8629	1282	311	8790	2258	319	9439	1896/7C	309
8641	2400C	314	8791	2258/3	319	9445	1896/5C	309
8661	2170	521	8879	650	292	9455	1896/9C	309
8662	2173	521	8899	1636	406	9457	1896/12C	309
8663	2142	521	8916	3079	383	9458	1896/15C	309
8668	2168	521	8917	3077	383	9478	760/2	278
8669	2174	521	8918	3075	383	9479	760/4	278
8670	2175	521	8919	3073	383	9486	5606B1801	208
8690	1133C	340	8920	3071	383	9487	5606B1601	208
8691	1136C	340	9156	1132C	340	9501	5471C	341
8692	1139C	340	9157	1134C	340	9502	5472C	341
8718	2473	348	9158	1306C	340	9503	5473C	341
8719	2471	348	9159	1135C	340	9504	5474C	341
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8722	2465C	316	9182	9823	246	9506	5476C	341
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8724	2464C	316	9209	9810	250	9508	5478C	341
8725	2467C	361	9244	9830	250	9509	5479C	341
8732	1243/4	313	9251	9008	250	9510	5480C	341
8734	1243	313	9269	9062AC	250	9512	6417	344
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8741	1302C	340	9309	5909C	342	9516	6420	344
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8743	1307C	340	9319	5909/19C	342	9520	6421	344
8746	1313C	340	9322	5610B2201	204	9521	6422	344
8747	1322C	340	9328	6434	358	9524	6423	344
8748	1323C	340	9329	6435	358	9525	5480/25C	341
8749	1327C	340	9330	6436	358	9526	6424	344
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8754	1309C	340	9332	6438	358	9533	6300/3	318
8755	1313C	340	9333	6439	358	9534	6300/4	318
8757	1305C	340	9335	6440	358	9535	6305	318
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8761	2401C	314	9363	5640B2201	210	9540	6300/10	318
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9565	6433	344	9814	6400	352	9943	6343	338
9608	6327	338	9819	6398	352	9944	6344	338
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9611	6330	338	9830	6402	353	9947	6347	338
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9683	6089C	345	9883	6314	359	9982	3252	381
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C2768A	2258/3	319	C6061A	6314	359						
C2882A	2254	319	C6062A	6315	359						

Fahrenheit-to-Celsius Conversion

Temperature Conversion Formula: °F = $\frac{9}{5}$ (°C + 32)

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
-40	-40.00	36	2.22	92	33.33	148	64.44	220	104.44
-38	-38.89	37	2.78	93	33.89	149	65.00	225	107.22
-36	-37.78	38	3.33	94	34.44	150	65.56	230	110.00
-34	-36.67	39	3.89	95	35.00	151	66.11	235	112.78
-32	-35.56	40	4.44	96	35.56	152	66.66	240	115.56
-30	-34.44	41	5.00	97	36.11	153	67.22	245	118.33
-28	-33.33	42	5.56	98	36.67	154	67.77	250	121.11
-26	-32.22	43	6.11	99	37.22	155	68.33	255	123.89
-24	-31.11	44	6.67	100	37.78	156	68.88	260	126.67
-22	-30.00	45	7.22	101	38.33	157	69.44	265	129.44
-20	-28.89	46	7.78	102	38.88	156	70.00	270	132.22
-18	-27.78	47	8.33	103	39.44	159	70.55	275	135.00
-16	-26.67	48	8.89	104	40.00	160	71.11	280	137.78
-14	-25.56	49	9.44	105	40.55	161	71.66	285	140.55
-12	-24.44	50	10.00	106	41.11	162	72.22	290	143.33
-10	-23.33	51	10.56	107	41.66	163	72.77	295	146.11
-8	-22.22	52	11.11	108	42.22	164	73.33	300	148.89
-6	-21.11	53	11.67	109	42.77	165	73.89	305	151.67
-4	-20.00	54	12.22	110	43.33	166	74.44	310	154.44
-2	-18.89	55	12.78	111	43.88	167	75.00	315	157.22
0	-17.78	56	13.33	112	44.44	168	75.55	320	160.00
1	-17.22	57	13.89	113	45.00	169	76.11	325	162.78
2	-16.67	58	14.44	114	45.55	170	76.67	330	165.56
3	-16.11	59	15.00	115	46.11	171	77.22	335	168.33
4	-15.56	60	15.56	116	46.66	172	77.77	340	171.11
5	-15.00	61	16.11	117	47.22	173	78.33	345	173.89
6	-14.44	62	16.67	118	47.77	174	78.88	350	176.67
7	-13.89	63	17.22	119	48.33	175	79.44	355	179.44
8	-13.33	64	17.78	120	48.89	176	80.00	360	182.22
9	-12.78	65	18.33	121	49.44	177	80.55	365	185.00
10	-12.22	66	18.89	122	50.00	178	81.11	370	187.78
11	-11.67	67	19.44	123	50.55	179	81.66	375	190.55
12	-11.11	68	20.00	124	51.11	180	82.22	380	193.33
13	-10.56	69	20.56	125	51.67	181	82.77	385	196.11
14	-10.00	70	21.11	126	52.22	182	83.33	390	198.89
15	-9.44	71	21.67	127	52.77	183	83.88	395	201.67
16	-8.89	72	22.22	128	53.33	184	84.44	400	204.44
17	-8.33	73	22.78	129	53.88	185	85.00	405	207.22
18	-7.78	74	23.33	130	54.44	186	85.55	410	210.00
19	-7.22	75	23.89	131	55.00	187	86.11	415	212.78
20	-6.67	76	24.44	132	55.55	188	86.66	420	215.56
21	-6.11	77	25.00	133	56.11	189	87.22	425	218.33
22	-5.56	78	25.56	134	56.66	190	87.78	430	221.11
23	-5.00	79	26.11	135	57.22	191	88.33	435	223.89
24	-4.44	80	26.67	136	57.77	192	88.88	440	226.67
25	-3.89	81	27.22	137	58.33	193	89.44	445	229.44
26	-3.33	82	27.78	138	58.88	194	90.00	450	232.22
27	-2.78	83	28.33	139	59.44	195	90.55	455	235.00
28	-2.22	84	28.89	140	60.00	196	91.11	460	237.78
29	-1.67	85	29.44	141	60.55	197	91.66	465	240.55
30	-1.11	86	30.00	142	61.11	198	92.22	470	243.33
31	-0.56	87	30.56	143	61.66	199	92.77	475	246.11
32	0	88	31.11	144	62.22	200	93.33	480	248.89
33	0.56	89	31.67	145	62.78	205	96.11	485	251.67
34	1.11	90	32.22	146	63.33	210	98.89	490	254.44
35	1.67	91	32.78	147	63.88	215	101.67	495	257.22
								500	260.00

Celsius-to-Fahrenheit Conversion

Temperature Conversion Formula: °C = $\frac{5}{9}$ (°F - 32)

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-40	-40.00	36	96.80	92	197.60	148	298.40	220	428.00
-38	-36.40	37	98.60	93	199.40	149	300.20	225	437.00
-36	-32.80	38	100.40	94	201.20	150	302.00	230	446.00
-34	-29.20	39	102.20	95	203.00	151	303.80	235	455.00
-32	-25.60	40	104.00	96	204.80	152	305.60	240	464.00
-30	-22.00	41	105.80	97	206.60	153	307.40	245	473.00
-28	-18.40	42	107.60	98	208.40	154	309.20	250	482.00
-26	-14.80	43	109.40	99	210.20	155	311.00	255	491.00
-24	-11.20	44	111.20	100	212.00	156	312.80	260	500.00
-22	-7.60	45	113.00	101	213.80	157	314.60	265	509.00
-20	-4.00	46	114.80	102	215.60	156	312.80	270	518.00
-18	-0.40	47	116.60	103	217.40	159	318.20	275	527.00
-16	3.20	48	118.40	104	219.20	160	320.00	280	536.00
-14	6.80	49	120.20	105	221.00	161	321.80	285	545.00
-12	10.40	50	122.00	106	222.80	162	323.60	290	554.00
-10	14.00	51	123.80	107	224.60	163	325.40	295	563.00
-8	17.60	52	125.60	108	226.40	164	327.20	300	572.00
-6	21.20	53	127.40	109	228.20	165	329.00	305	581.00
-4	24.80	54	129.20	110	230.00	166	330.80	310	590.00
-2	28.40	55	131.00	111	231.80	167	332.60	315	599.00
0	32.00	56	132.80	112	233.60	168	334.40	320	608.00
1	33.80	57	134.60	113	235.40	169	336.20	325	617.00
2	35.60	58	136.40	114	237.20	170	338.00	330	626.00
3	37.40	59	138.20	115	239.00	171	339.80	335	635.00
4	39.20	60	140.00	116	240.80	172	341.60	340	644.00
5	41.00	61	141.80	117	242.60	173	343.40	345	653.00
6	42.80	62	143.60	118	244.40	174	345.20	350	662.00
7	44.60	63	145.40	119	246.20	175	347.00	355	671.00
8	46.40	64	147.20	120	248.00	176	348.80	360	680.00
9	48.20	65	149.00	121	249.80	177	350.60	365	689.00
10	50.00	66	150.80	122	251.60	178	352.40	370	698.00
11	51.80	67	152.60	123	253.40	179	354.20	375	707.00
12	53.60	68	154.40	124	255.20	180	356.00	380	716.00
13	55.40	69	156.20	125	257.00	181	357.80	385	725.00
14	57.20	70	158.00	126	258.80	182	359.60	390	734.00
15	59.00	71	159.80	127	260.60	183	361.40	395	743.00
16	60.80	72	161.60	128	262.40	184	363.20	400	752.00
17	62.60	73	163.40	129	264.20	185	365.00	405	761.00
18	64.40	74	165.20	130	266.00	186	366.80	410	770.00
19	66.20	75	167.00	131	267.80	187	368.60	415	779.00
20	68.00	76	168.80	132	269.60	188	370.40	420	788.00
21	69.80	77	170.60	133	271.40	189	372.20	425	797.00
22	71.60	78	172.40	134	273.20	190	374.00	430	806.00
23	73.40	79	174.20	135	275.00	191	375.80	435	815.00
24	75.20	80	176.00	136	276.80	192	377.60	440	824.00
25	77.00	81	177.80	137	278.60	193	379.40	445	833.00
26	78.80	82	179.60	138	280.40	194	381.20	450	842.00
27	80.60	83	181.40	139	282.20	195	383.00	455	851.00
28	82.40	84	183.20	140	284.00	196	384.80	460	860.00
29	84.20	85	185.00	141	285.80	197	386.60	465	869.00
30	86.00	86	186.80	142	287.60	198	388.40	470	878.00
31	87.80	87	188.60	143	289.40	199	390.20	475	887.00
32	89.60	88	190.40	144	291.20	200	392.00	480	896.00
33	91.40	89	192.20	145	293.00	205	401.00	485	905.00
34	93.20	90	194.00	146	294.80	210	410.00	490	914.00
35	95.00	91	195.80	147	296.60	215	419.00	495	923.00
								500	932.00

Glossary

abrasion resistance Ability of a wire or cable material to resist surface wear.

accelerated aging A test in which voltage, temperature, etc., are increased above normal operating values to obtain observable deterioration in a relatively short period of time. The plotted results give expected service life under normal conditions.

accelerator A chemical additive which hastens a chemical reaction under specific conditions.

adhesive lined For heat-shrink tubing, an inner lining that, when heated, adheres to the substrate, providing additional strength and environmental sealing.

admittance The measure of the ease with which an alternating current flows in a circuit. The reciprocal of impedance.

aging The change in properties of a material with time under specific conditions.

air-spaced coaxial cable One in which air is the essential dielectric material. A spirally wound synthetic filament or spacer may be used to center the conductor.

alloy A metal formed by combining two or more different metals to obtain desirable properties.

ALS A type of cable consisting of insulated conductors enclosed in a continuous, closely fitting aluminum tube.

alternating current (AC) Electric current that continually reverses its direction. It is expressed in cycles per second (hertz or Hz).

ambient temperature The temperature of a medium surrounding an object.

ampacity See current-carrying capacity.

ampere The unit of current. One ampere is the current flowing through one ohm of resistance at one volt potential.

analog circuit Output of electrical signals as a continuous function of input, as contrasted with digital circuit.

anneal Relief of mechanical stress through heat and gradual cooling. Annealing copper renders it less brittle.

annealed wire Wire, which after final drawdown, has been heated and slowly cooled to remove the effects of cold working.

ANSI American National Standards Institute.

anti-oxidant A substance which prevents or slows down oxidation of material exposed to air.

arc resistance The time required for an arc to establish a conductive path in a material.

armor A braid or wrapping of metal, usually steel, used for mechanical protection. Generally placed over the outer jacket.

ASA American Standards Association. Former name of ANSI.

ASCII American Standard Code for Information Interchange.

ASME American Society of Mechanical Engineers.

ASTM American Society for Testing and Materials, a nonprofit industry-wide organization which publishes standards, methods of test, recommended practices, definitions and other related material.

attenuation Power loss in an electrical system. In cables, generally expressed in dB per unit length, usually 1000 ft.

audio frequency The range of frequencies audible to the human ear. Usually 30 Hz to 20,000 Hz.

AWG American Wire Gauge. A standard system for designating wire diameter.

AWM Appliance Wiring Material.

backbone wiring The physical/electrical interconnections between telecommunications closets and equipment rooms. Cross-connect hardware and cabling in the main and intermediate cross-connections are considered part of the backbone wiring.

balanced circuit A circuit so arranged that the impressed voltages on each conductor of the pair are equal in magnitude but opposite in polarity with respect to ground.

band marking A continuous circumferential band applied to a conductor at regular intervals for identification.

bandwidth The difference between the upper and lower limits of a given band of frequencies. Expressed in hertz (Hz).

baud Unit of data transmission speed representing bits per second. 9600 baud = 9600 bits per second.

bend radius The radius of curvature that a wire or cable can bend without causing any damaging effects.

Glossary

binder A spirally served tape or thread used for holding assembled cable components in place awaiting subsequent manufacturing operations.

bit error rate (BER) Discrepancy between outgoing and incoming bits transmitted between data equipment.

bit One binary digit.

bond strength Amount of adhesion between surfaces, e.g. in cemented ribbon cable.

braid A fibrous or metallic group of filaments interwoven in cylindrical form to form a covering over one (1) or more wires.

braid angle The smaller of the two angles formed by the shielding strand and the axis of the cable being shielded.

braid carrier A spool or bobbin on a braider which holds one group of strands or filaments consisting of a specific number of ends. The carrier revolves during braiding operations.

braid ends The number of strands used to make up one carrier. The strands are wound side by side on the carrier bobbin and lie parallel in the finished braid.

breakdown voltage The voltage at which the insulation between two conductors is destroyed.

breakout The point at which a conductor or group of conductors is separated from a multiconductor cable to complete circuits at various points along the main cable.

building wire Wire used for light and power, 600 volts or less, usually not exposed to outdoor environment.

bunch stranding A group of wires of the same diameter twisted together without a predetermined pattern.

buried cable A cable installed directly into the earth without the use of underground conduit. Also called "direct burial cable."

byte A group of eight binary digits.

CSA Canadian Standards Association a nonprofit, independent organization which operates a listing service for electrical and electronic materials and equipment. The Canadian counterpart of the Underwriters Laboratories.

cable An insulated conductor or group of individually insulated conductors in twisted or parallel configuration with a protective jacket.

cable assembly A length of cable with connectors on one or both ends.

cable track, C track Flexible plastic or metallic tray, used to guide and protect cables in high speed motion applications.

cabling The twisting together of two or more insulated conductors to form a cable.

cabling factor Used in the formula for calculating the diameter of an unshielded, unjacketed cable. $D = Kd$, where the D is the cable diameter, K is the factor, and d is the diameter of one insulated conductor.

CAD/CAM Computer aided design/ computer aided manufacturing.

campus backbone Wiring between buildings that share telecommunications facilities.

capacitance The ratio of the electrostatic charge on a conductor to the potential difference between the conductors required to maintain that charge.

capacitance, direct The capacitance measured directly from conductor to conductor through a single insulating layer.

capacitance, mutual The capacitance between two conductors with all other conductors, including shield, short circuited to ground.

capacitive coupling Electrical interaction between two conductors caused by the capacitance between them.

carrier frequency The electromagnetic wave frequency selected to transmit information. Optical carrier frequency is from the infrared, visible range or ultraviolet spectrum areas (10¹² Hz and above).

CE (Conformité Européenne) European Economic Community approval indicating that a product complies with a European Directive.

cellular (foamed) polyethylene Expanded or "foam" polyethylene consisting of individual closed cells suspended in a polyethylene medium.

CENELEC European Economic Community Committee for Standardization of technical requirements.

center-to-center distance See pitch.

certificate of compliance (C of C) A certificate which is normally generated by a quality control department, which shows that the product being shipped meets customer's specifications.

Glossary

certified test report (CTR) A report providing actual test data on a cable. Tests are normally run by a quality control department, which shows that the product being shipped conforms to test specifications.

characteristic impedance The impedance that, when connected to the output terminals of a transmission line of any length, makes the line appear infinitely long. The ratio of voltage to current at every point along a transmission line on which there are no standing waves.

CIP Common Industrial Protocol. A media-independent application-layer protocol used by DeviceNet, ControlNet, and EtherNet/IP. Trademark of ODVA.

circuit The entire route of an electric current.

circular mil The area of a circle one mil (0.001") in diameter; 7.845×10^{-7} sq. in. Used in expressing wire cross sectional area.

cladding A method of applying a layer of metal over another metal whereby the junction of the two metals is continuously welded.

coaxial cable A cable consisting of two cylindrical conductors with a common axis, separated by a dielectric.

cold flow Permanent deformation of the insulation due to mechanical force or pressure (not due to heat softening).

color code A system for circuit identification through use of solid colors and contrasting tracers.

common axis cabling In multiple cable constructions, a twisting of all conductors about a "common axis" with two conductor groups then selected as pairs. This practice yields smaller diameter constructions than does a separate axis construction, but tends to yield greater susceptibility to EMI and ESI.

common mode noise Noise, caused by a difference in "group potential." By grounding at either end rather than both ends (usually grounded at source) one can reduce this interference.

composite cable A cable containing more than one gauge size or a variety of circuit types, e.g., pairs, triples, quads, coaxials, etc.

compound An insulating or jacketing material made by mixing two or more ingredients.

concentric stranding A central wire surrounded by one or more layers of helically wound strands in a fixed round geometric arrangement.

concentricity In a wire or cable, the measurement of the location of the center of the conductor with respect to the geometric center of the surrounding insulation.

conductance The ability of a conductor to carry an electrical charge. The ratio of the current flow to the potential difference causing the flow. The reciprocal of resistance.

conductivity The capability of a material to carry electrical current—usually expressed as a percentage of copper conductivity (copper being 100%).

conductor An uninsulated wire suitable for carrying electrical current.

conductor spacing Distance between the closest edges of two adjacent conductors.

conduit A tube or trough in which insulated wires and cables are passed.

connector A device used to physically and electrically connect two or more conductors.

connector adapter A special type of connector that allows mating of otherwise incompatible connectors. Examples include a female adapter that mates two male connectors; or a connector that mates a 9-position connector to a 25-position connector.

contact The parts of a connector which actually carry the electrical current and are touched together or separated to control the flow.

continuity check A test to determine whether electrical current flows continuously throughout the length of a single wire or individual wires in a cable.

continuous vulcanization Simultaneous extrusion and vulcanization of rubber-like wire coating materials.

control cable A multiconductor cable made for operation in control or signal circuits.

ControlNet An industrial automation protocol that is highly scheduled and deterministic, operates at 5 Mb/s, and uses the same CIP application layer protocol as DeviceNet and EtherNet/IP. Trademark of ODVA.

copolymer A compound resulting from the polymerization of two different monomers.

Glossary

copper A reddish metal that is an excellent conductor of electricity.

copper-clad Steel with a coating of copper welded to it.

Copperweld Copperweld Steel's trademark for copper-covered steel conductor.

cord A small, flexible insulated cable.

core In cables, a component or assembly of components over which additional components (shield, sheath, etc.) are applied.

corona A discharge due to ionization of air around a conductor due to potential gradient exceeding a certain critical value.

corona resistance The time that the insulation will withstand a specified level of field-intensified ionization that does not result in the immediate complete breakdown of the insulation.

corrosion The deterioration of a material by chemical reaction or galvanic action.

coverage The percent of completeness with which a metal braid covers the underlying surface.

CRCS Continuous rigid cable support. Synonymous with tray.

creep The dimensional change with time of a material under load.

cross-linked Inter-molecular bonds between long chain thermoplastic polymers by chemical or electron bombardment means. The properties of the resulting thermosetting material are usually improved.

cross-linked polyethylene A form of polyethylene whose molecules are more closely linked to produce a greater balance of physical and electrical properties.

crosstalk A type of interference caused by signals from one circuit being coupled into adjacent circuits.

C-track A cable guide mechanism manufactured of either plastic or metal used in continuous flexing applications.

current Flow of electricity, measured in amps.

current-carrying capacity The maximum current an insulated conductor can safely carry without exceeding its insulation and jacket temperature limitations.

cut-through resistance The ability of a material to withstand mechanical pressure, (usually a sharp edge or small radius) without separation.

CV Continuous vulcanization.

cycle life The number of repetitive flex motions that a wire or cable can withstand prior to breakdown.

decibel (dB) A unit to express differences of power level. A term that expresses two power levels used to indicate gains or losses in a system.

delay line A cable made to provide a very low velocity of propagation with long electrical delay for transmitted signals.

derating factor A factor used to reduce the current carrying capacity of a wire when used in environments other than that for which the value was established.

DeviceNet An industrial automation protocol operating in either a master/slave or distributed fashion to connect controllers to sensors. Trademark of ODVA.

dielectric Any insulating (nonconducting) material between two conductors.

dielectric constant (k) The ratio of the capacitance using the material in question as the dielectric, to the capacitance resulting when the material is replaced by air.

dielectric strength The voltage which an insulation can withstand before breakdown occurs. Usually expressed as a voltage gradient (such as volts per mil).

dielectric test A test in which a voltage higher than the rated voltage is applied for a specified time to determine the adequacy of the insulation under normal conditions.

digital Representation of data by discrete characters.

direct burial cable A cable installed directly in the earth, without a conduit.

direct current (DC) An electric current which flows in one direction.

direct current resistance (DCR) The resistance offered by any circuit to the flow of direct current.

direction of lay The lateral direction in which the strands of a conductor run over the top of the cable conductor as they recede from an observer looking along the axis of the conductor or cable. Also applies to twisted cable.

Glossary

dissipation factor The tangent of the loss angle of the insulating material. (Also referred to as loss tangent, $\tan \delta$, and approximate power factor.)

drain wire In a cable, the uninsulated wire in intimate contact with a shield to provide for easier termination of such a shield to ground.

drawing In wire manufacture, pulling the metal through a die or series of dies to reduce diameter to a specified size.

dual wall With heat shrink tubing, a construction having a double-layer construction, with the inner wall typically having an adhesive or meltable structure to bond and seal the tubing to the substrate.

duct An underground or overhead tube for carrying electrical cables.

duplex insulated In the thermocouple industry, a combination of dissimilar metal conductors of a thermocouple or thermocouple extension wire.

eccentricity Like concentricity, a measure of the center of a conductor's location with respect to the circular cross section of the insulation. Expressed as a percentage of displacement of the circle within the other.

ECTFE Ethylene chlorotrifluoroethylene.

EIA Electronic Industries Alliance.

elastomer A class of long-chain polymers capable of being crosslinked to produce elastic compounds, e.g. polychloroprene and ethylene propylene rubber.

electromagnetic Pertaining to the combined electric and magnetic fields associated with movements of electrons through conductors.

electromotive force (EMF) Pressure or voltage. The force which causes current to flow in a circuit.

electrostatic Pertaining to static electricity or electricity at rest. A constant intensity electric charge.

elongation The fractional increase in length of a material stressed in tension.

EMC Electromagnetic compatibility. No emission of interference exceeding FCC limits.

EMF See electromotive force.

EMI Electromagnetic interference.

EMP Electromagnetic pulse.

ends In braiding, the number of essentially parallel wires or threads on a carrier.

EPOS Abbreviation for electronic point-of-sale.

EPR Ethylene-propylene rubber, having similar physical properties to butyl rubber. The polymer is chemically cross-linked.

epoxy An adhesive used in the connector termination process.

EtherNet/IP An industrial automation protocol using CIP for upper layers and Ethernet for the lower layers. Trademark of ODVA.

ETFE Ethylene tetrafluoroethylene.

ETPC Abbreviation for electrolytic tough pitch copper. It has a minimum conductivity of 99.9%.

expanded diameter Diameter of shrink tubing as supplied. When heated, the tubing will shrink to its extruded diameter.

external interference The effects of electrical waves or fields which cause spurious signals other than the desired intelligence, e.g. noise.

extrusion A process of continuously applying an insulation over a conductor or jacket (rubber or plastic compounds).

FAA Federal Aeronautics Administration.

farad (F) Unit of capacitance whereby a charge of one coulomb produces a one volt potential difference.

fatigue resistance Resistance to metal crystallization which leads to conductors breaking from flexing.

feedback Transfer of some output energy of an amplifier to its input, so as to modify its characteristic.

FEP Fluorinated ethylene propylene.

FHDPE Foamed high-density polyethylene.

Fieldbus (1) A generic term for communication protocols used in industrial networks for instrumentation and control. (2) A specific set of protocols that includes Foundation Fieldbus and HSE (High-Speed Ethernet).

figure 8 cable An aerial cable configuration in which the conductors and the steel strand which supports the cable are integrally jacketed. A cross section of the finished cable approximates the figure "eight."

Glossary

filled cable A telephone cable construction in which the cable core is filled with a material that will prevent moisture from entering or passing through the cable.

filler (1) A material used in multiconductor cables to occupy large interstices formed by the assembled conductors. (2) An inert substance added to a compound to improve properties or decrease cost.

film A thin plastic sheet.

FIT® Alpha Wire registered trademark for shrinkable tubing and wire management products.

flame resistance The ability of a material not to propagate flame once the flame source is removed.

flammability The measure of the material's ability to support combustion.

flat cable Multiconductor cable arranged in a parallel type configuration manufactured with controlled tolerance spacing.

flat conductor A wire having a rectangular cross section as opposed to round or square conductors.

flat conductor cable A cable with several flat conductors.

FLC Fluorocopolymer insulating and/or jacketing compounds.

flex life The measurement of the ability of a conductor or cable to withstand repeated bending.

flexibility That quality of a cable or cable component which allows for bending under the influence of outside force, as opposed to limpness which is bending due to the cable's own weight.

foam polyethylene See cellular polyethylene.

foamed plastics Insulations having a cellular structure.

FPE Foam polyethylene.

FPP Foam polypropylene.

frequency Number of times an alternating current reverses itself in one second. Express in Hertz (hz), which is one cycle per second.

gang strip Simultaneous stripping all conductors in a flat or ribbon cable.

Gauge A term used to denote the physical size of a wire.

Giga- A numerical prefix denoting one billion (10^9).

gigahertz (GHz) A unit of frequency equal to one billion hertz.

ground A conducting connection between an electrical circuit and the earth or other large conducting body to serve as an earth thus making a complete electrical circuit.

ground fault A failure of transmission involving insulation-to-shield or insulation-to-ground wire.

halogen Elements such as fluorine, chlorine, bromine, and iodine that are highly reactive and can be harmful to people and animals.

hard-drawn copper wire Copper wire that has not been annealed after drawing.

harmonized Products meeting requirements of CENELEC for use in European Economic Community.

harness An arrangement of wires and cables, usually with many breakouts, which have been tied together or pulled into a rubber or plastic sheath, used to interconnect electric circuits.

hash mark stripe A non-continuous helical stripe applied to a conductor for identification.

heat distortion Distortion or flow of a material or configuration due to application of heat.

heat endurance The time of heat aging that a material can withstand before failing a specific physical test.

heat shock A test to determine stability of a material by sudden exposure to a high temperature for a short period of time.

helical stripe A continuous, colored, spiral stripe applied to a conductor for circuit identification.

henry (H) The unit of inductance.

hertz (Hz) The unit of frequency, expressing cycles per second.

high voltage Generally, a wire or cable with an operating voltage of over 600 volts.

hi-pot A test designed to determine the highest voltage that can be applied to a conductor without electrically breaking down the insulation.

hook-up wire A single insulated conductor used for low current, low voltage (usually under 1000 volts) applications within enclosed electronic equipment.

hygroscopic Readily absorbing and retaining moisture.

ICEA Insulated Cable Engineers Association.

Glossary

IDC Insulation displacement connector.

IEC International Electrotechnical Commission.

IEEE Institute of Electrical and Electronic Engineers.

IEEE-488 A standard for connecting test equipment. Also known as General-Purpose Interface Bus (GPIB).

impact strength A test for determining the mechanical punishment a cable can withstand without physical or electrical breakdown by impacting with a given weight, dropped a given distance, in a controlled environment.

impedance The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. It is a combination of resistance R and reactance X , measured in ohms.

IMSA International Municipal Signal Association.

index edge See reference edge.

inductance The property of a circuit or circuit element that opposes a change in current flow, thus causing current changes to lag behind voltage changes. It is measured in henrys.

inductive coupling Crosstalk resulting from the action of the electromagnetic field of one conductor on the other.

insulation A material having high resistance to the flow of electric current. Often called a dielectric in radio frequency (coaxial) cable.

insulation resistance The ratio of the applied voltage to the current between two electrodes in contact with a specific insulation.

Insulation A material having high resistance to the flow of electric current.

interconnecting cable The wiring between modules, between units, or the larger portions of a system.

interference Electrical or electromagnetic disturbances which introduce undesirable responses into other electronic equipment.

interstices Voids or valleys between individual strands in a conductor or between insulated conductors in a multiconductor cable during extreme flexing.

IPCEA Insulated Power Cable Engineers Association.

irradiated Exposure to high-energy radiation resulting in cross-linking of molecules.

irradiation In insulations, the exposure of the material to high energy emissions for the purpose of favorably altering the molecular structure.

ISA Originally, Instrument Society of America, now called International Society of Automation.

ISO International Standards Organization.

jacket An outer covering, usually non-metallic, mainly used for protection against the environment.

jumper cable A short flat cable interconnecting two wiring boards or devices.

kilo- (k) A numerical prefix denoting 1000 (10^3).

kilometer (km) 1000 meters or 3281 feet (0.621 miles).

kpsi Tensile strength in thousands of pounds per square inch.

kV kilovolt, 1000 volts

laminated tape A tape consisting of two or more layers of different materials bonded together.

lay The length measured along the axis of a wire or cable required for a single strand (in stranded wire) or conductor (in cable) to make one complete turn about the axis of the conductor or cable.

leakage current The undesirable flow of current through or over the surface of an insulation.

life cycle A test to determine the length of time before failure in a controlled, usually accelerated, environment.

limits of error The maximum deviation (in degrees or percent) of a thermocouple or thermocouple extension wire from standard EMF-temperature to be measured.

link The complete point-to-point communications path between transmitter and receiver.

litz A type of specialty cable designed to reduce AC losses in conductors from skin and proximity effects at high frequencies to make transformers and motors more efficient. Litz wire consists of individually insulated strands woven or twisted in a specific pattern so that each tends to occupy all possible positions in the cross section, thereby equalizing flux linkages and reactances.

Glossary

Loc-Trac® Alpha Wire's registered trademark for a zipper tubing closure track which does not require any sealants to keep it closed.

local area network (LAN)

A baseband or broadband interactive bidirectional communication system for voice, video or data use on a common cable medium.

longitudinal shield A tape shield, flat or corrugated, applied parallel to the axis of the core being shielded.

longitudinal shrinkage A term generally applied to shrink products denoting the discrete axial length lost through heating in order to obtain the recovered diameter.

loop resistance The total resistance of two conductors measured round trip from one end.

loss Energy dissipated without accomplishing useful work.

loss factor The product of the dissipation and dielectric constant of an insulating material.

low loss A cable that has relatively small power loss over long lengths.

low-loss dielectric An insulating material that has a relatively low dielectric loss, such as polyethylene or PTFE.

LSZH Low-smoke, zero halogen. An insulating material that contains no halogens or other potentially toxic materials and that generates very low levels of smoke when burned.

magnetic field The region within which a body or current experiences magnetic forces.

magnetic flux The rate of flow of magnetic energy across or through a surface (real or imaginary).

magnetic noise Caused by change in current level, e.g. AC powerline (creates magnetic field around that cable) this magnetic field causes the magnetic noise.

mastic A meltable coating used on the inside of some shrink products which, when heated, flows to encapsulate the interstitial air voids.

MCM Thousand circular mils.

mega- (M) A numerical prefix denoting 1,000,000 (10^6).

meter Unit of measurement, one meter equals 3.28 feet.

mho The unit of conductivity. The reciprocal of an ohm.

MHz Megahertz (one million cycles per second).

micro- A numerical prefix denoting one-millionth (10^{-6}).

microwave A short (usually less than 30 cm) electrical wave.

mil A unit used in measuring diameter of a wire or thickness of insulation over a conductor. One-one thousandth of an inch (.001").

milli- (m) Prefix meaning 1/1000 (10^{-3}).

millimeter One millimeter equals 0.03937 inches.

MIL-SPEC Military Specification. A document of the U.S. Government, issued to define a product that will be used in military end-use applications.

mismatch A termination having a different impedance than that for which a circuit or cable is designed.

modulation The coding of information onto the carrier frequency. Modulation means include (among others) amplitude, frequency, or phase pulse many forms of on-off digital coding.

modulus of elasticity The ratio of stress to strain in an elastic material.

moisture absorption The amount of moisture, in percentage, that a material will absorb under specified conditions.

moisture resistance The ability of a material to resist absorbing moisture from the air or when immersed in water.

monomer The basic chemical unit used in building a polymer.

MSHA Mine Safety and Health Administration.

MTW Machine tool wire.

multiconductor More than one conductor within a single cable complex.

mutual capacitance Capacitance between two conductors when all other conductors including ground are connected together and then regarded as an ignored ground.

nano- A numerical prefix denoting one-billionth (10^{-9}).

nanosecond One billionth of a second (10^{-9} second).

NBFU National Board of Fire Underwriters.

NBS National Bureau of Standards.

Glossary

NEC National Electrical Code. A consensus standard published by the National Fire Protection Association (NFPA) and incorporated in OSHA regulations.

NEMA National Electrical Manufacturers Association.

neoprene Thermosetting material, chemically known as polychloroprene, with excellent flame retarding and abrasion resisting qualities used as a jacketing material.

NFPA National Fire Protection Association, group that publishes the NEC.

noncontaminating PVC A polyvinylchloride formulation, which does not produce electrical contamination.

nylon A group of polyamide polymers which are used for wire and cable jacketing.

ODVA Formerly Open DeviceNet Vendors Association.

OFHC oxygen-free, high conductivity copper. It has no residual deoxidant, 99.95% minimum copper content and an average annealed conductivity of 101%.

ohm Unit of resistance such that a constant current of one ampere produces a force of one Volt.

Ohm's law 1) volts = current x resistance; 2) current = volts/ resistance; 3) resistance = volts/ current.

operating temperature range Indicates the range of temperature at which the cable or tubing can be used without loss of its physical properties.

OSHA Occupational Safety and Health Act.

outgassing Percentage of a gas released during the combustion of insulation or jacketing material.

overlap The amount the trailing edge laps over the leading edge of a tape wrap.

oxygen index Percentage of oxygen necessary to support combustion in gas mixture.

ozone Form of oxygen, produced by discharge of electricity into air and harmful to certain insulation.

pairing The union of two insulated single conductors through twisting.

PE Polyethylene.

percent conductivity Conductivity of a material expressed as a percentage of that of copper.

permittivity See dielectric constant.

phase 360 degrees represents one cycle. A fraction of one cycle is called a phase.

pick Distance between two adjacent crossover points of braid filaments. The measurement in picks per inch indicates the degree of coverage.

pico- (p) A numerical prefix denoting one-millionth of one-millionth (10^{-12}).

picrofarad (pF) One trillionth of a farad (10^{-12}).

pitch In flat cable, the nominal distance between the index edges of two adjacent conductors.

pitch diameter Diameter of a circle passing through the center of the conductors in any layer of a multiconductor cable.

plastic deformation Change in dimensions under load that is not recovered when the load is removed.

plasticizer A chemical agent added to plastics to make them softer and more pliable.

plenum The air return path of a central air handling system, either ductwork or open space over a dropped ceiling.

plenum cable Cable approved by Underwriters Laboratories for installation in plenums without the need for conduit.

PLTC Power-limited tray cable.

point-to-point wiring Continuous conductors terminated at each end to circuit destinations.

polychloroprene Chemical name of neoprene.

polyester Polyethylene terephthalate, which is used extensively in the production of a high-strength moisture-resistant film used as a cable core wrap.

polyethylene A family of insulations derived from the polymerization of ethylene gas and characterized by outstanding electrical properties, including high IR, low dielectric constant, and low dielectric loss across the frequency spectrum. Mechanically rugged, it resists abrasion and cold flow.

polyhalocarbon A general name for polymers containing halogen atoms. The halogens are fluorine, chlorine and bromine.

polymer A material of high molecular weight formed by the chemical union of monomers.

Glossary

polyolefin A family of thermoplastics based upon the unsaturated hydrocarbons known as olefins. When combined with butylene or styrene polymers, they form compounds such as polyethylene and polypropylene.

polyurethane A family of flexible, abrasion resistant jackets used for Xtra-Guard® 2 harsh environment cables.

polyvinylchloride A general purpose family of insulations whose basic constituent is polyvinylchloride or its copolymer with vinyl acetate. Plasticizers, stabilizers, pigments and fillers are added in lesser quantity to improve mechanical and/or electrical properties of this material.

porosity Multiple air voids in an insulation or jacket wall.

potting The sealing of a cable termination or other component with a liquid which thermosets into an elastomer.

power Rate at which work is done in moving current, measured in watts. Power = Pressure x Current.

power factor The ratio of resistance to impedance. The ratio of the actual power of an alternating current to apparent power. Mathematically, the cosine of the angle between the voltage applied and the current resulting.

primary insulation The first layer of nonconductive material applied over a conductor, whose prime function is to act as electrical barrier (insulation).

PROFIBUS An industrial automation fieldbus.

propagation delay Time required for an electrical wave to travel between two points on a transmission line.

propagation time Time required for a wave to travel between two points on a transmission line.

propagation velocity See Velocity of Propagation.

psi Pound per square inch.

PTFE Polytetrafluoroethylene.

pulling eye A device fastened to a cable to which a hook may be attached in order to pull the cable into or from a duct.

pulse cable A type of coaxial cable constructed to transmit repeated high voltage pulses without degradation.

put-up and packaging The method of packaging product. May be expressed in units or footage. May show 4 foot lengths, spools, coils or long lengths of wire, cable and tubing products.

PV Photovoltaic.

PVC Polyvinylchloride.

PVDF Polyvinylidene fluoride.

QPL Qualified parts list.

quad A four-conductor cable.

rad The unit of radian dose which is absorbed, equal to .01 joule/kilogram.

radio frequency One suitable for radio transmission, above 104 Hz and below 3 GHz.

rated temperature The maximum temperature at which an electric component can operate for extended periods without loss of its basic properties.

rated voltage The maximum voltage at which an electric component can operate for extended periods without undue degradation or safety hazard.

REACH Registration, Evaluation and Authorization of Chemical Substances. An EU framework for regulating the production and use of chemical substances.

reactance The opposition offered to the flow of alternation current by inductance or capacitance of a component or circuit.

recovered diameter Diameter of shrinkable products after heating has caused it to return to its extruded diameter.

reference edge Edge of cable or conductor from which measurements are made. Sometimes indicated by a thread, stripe, printing or other identifying mark. Conductors are usually identified by their sequential position from the reference edge, with number one conductor closest to the edge.

reference junction The junction of a thermocouple which is at a known reference temperature. Also known as the "cold" junction, it is usually located at the emf measuring device.

reflection loss The part of a signal which is lost due to reflection of power at a line discontinuity.

reflow soldering The process of connecting two solder-coated conductive surfaces by remelting of the solder to cause fusion.

repeater A transmitter and receiver combination used to regenerate a signal along the communications path.

Glossary

resin A synthetic organic material formed by the union (polymerization) of one or more monomers with one or more acids.

resistance A measure of the difficulty in moving electrical current through a medium when voltage is applied. It is measured in ohms.

retractile cord A cable that returns by its own stored energy from an extended condition to its original contracted form.

RF Radio frequency.

RFI Radio frequency interference.

RG/U Radio Government, Universal. RG is the military designation for coaxial cable in MIL-DTL-17 and U stands for "general utility."

ribbon cable A flat cable of individually insulated conductors lying parallel and held together by means of adhesive film laminate.

ridge marker One or more ridges running laterally along the outer surface of an insulated wire for purposes of identification.

ringing out The process of locating or identifying specific conductive paths by means of passing current through selected conductors.

RJ-11 A 6-position modular plug and jack connector system.

RJ-45 An 8-position modular plug and jack connector system, widely used in local- and wide-area networks.

Rockwell hardness A test for determining hardness in which a hardened steel ball or diamond point is pressed into the material under test.

RoHS Restriction of Hazardous Substances. A regulatory framework for restricting the amounts of hazardous substances, including lead, mercury, cadmium, hexavalent chromium, PBB, and PBDE, in materials.

root mean square (RMS) The effective value of an alternating current or voltage.

rope lay Cable composed of central core surrounded by one or more layers of helically laid groups of wires. Usually extremely flexible.

routing The path followed by a cable or conductor.

RS-232 A serial communications protocol using single-ended signaling for connecting data equipment at speeds up to 230.4 kb/s.

RS-422 A serial communications protocol using differential signaling for connecting equipment, at speeds to 10 Mb/s.

RS-423 A serial communications protocol using single-ended signaling for connecting data terminal equipment to data circuit-terminating equipment.

RS-485 A serial communications protocol using balanced signaling for connecting data terminal equipment to data circuit-terminating equipment, at speeds to 10 Mb/s over long distances and in noisy environments.

SAE Society of Automotive Engineers.

self-extinguishing The characteristic of a material whose flame is extinguished after the igniting flame is removed.

semiconductor A material that has a resistance characteristic between that of insulators and conductors.

semirigid PVC A hard semi-flexible polyvinylchloride compound with low plasticizer content.

separator A layer of insulating material such as textile, paper, polyester, etc. Used to improve stripping qualities, flexibility, mechanical or electrical protection to the components.

serve A filament or group of filaments such as fibers or wires, wound around a central core.

sheath The outer covering or jacket of a multiconductor cable.

shelf life Length of time under specified conditions that a material retains its usability.

shield A metallic layer, commonly aluminum or copper, of tape, braid or spiral wrapped wire construction. Its primary purpose is to prevent electrostatic or electromagnetic interference between adjacent wires and external sources.

shield coverage The physical area of a cable that is actually covered by the shielding material and is expressed in percent.

shield effectiveness The relative ability of a shield to screen out undesirable signals.

shrink ratio The ratio of shrinkage of tubing inside diameter from the expanded size to the fully recovered dimension.

shrink temperature That temperature which effects complete recovery of a shrinkable product from the expanded state.

Glossary

shrink tubing Tubing which has been extruded, cross-linked and non cross-linked, and mechanically expanded which when reheated will return to its original diameter.

signal A current used to convey information, either digital, analog, audio or video.

signal cable A cable designed to carry current of usually less than one ampere per conductor.

simplex Mode of data transmission in one direction only. Usually on a two-wire facility.

sintering A method of heat sealing. Fusion of a spirally applied tape wrap jacket by the use of high heat to a homogenous continuum. Usually employed for fluorocarbon, non-extrudable materials.

SIS XLP switchboard wire.

skin effect The phenomenon in which the depth of penetration of electric currents into a conductor decreases as the frequency increases.

sleeving A braided, extruded or woven tube.

SNR Signal-to-noise ratio.

soldering sleeves Shrinkable tubing with a solder preform used for highest reliability soldering connections or shield grounding.

solid conductor A conductor consisting of a single wire.

span In flat cables, the distance from the reference edge of the first conductor to the reference edge of the last conductor (in cables having flat conductors), or the distance between the centers of the first and last conductors (in cables having round conductors), expressed in inches or centimeters.

spark test A test designed to locate imperfections (usually pin-holes) in the insulation of a wire or cable by application of a voltage for a very short period of time while the wire is being drawn through the electrode field.

specific gravity The ratio of the density (mass per unit volume) of a material to that of water.

specific inductive capacity (SIC) See dielectric constant.

spiral wrap The helical wrap of a material over a core.

splice A mechanical device or fusion process that permanently bonds two fibers together without a connector producing extremely low loss.

spool Circular container on which wire is wound for storage or transit normally refers to sizes smaller than 18" in diameter.

stability factor The difference between the percentage power factor at 80 volts/mil and at 40 volts/mil measured on wire immersed in water at 75°C for a specified time.

static condition Used to denote the environmental conditions of an installed cable rather than the conditions existing during cable installation.

STP Shielded twisted pair cable.

strand A single uninsulated wire.

stranded conductor A conductor composed of single solid wires twisted together, either singly or in groups.

strip force The force required to remove a small section of insulating material from the conductor it covers.

structural return loss (SRL) Expresses the amount of signal lost in negative terms, and occurs when signals reflect back to points of transmission.

suggested working voltage AC voltage that can be applied between adjacent conductors.

Supra-Shield® Alpha Wire's trade name for foil/braid combination used for maximum shielding effectiveness.

surface resistivity The resistance of a material between two opposite sides of a unit square of its surface. It is usually expressed in ohms.

surge A temporary, large increase in the voltage or current in an electric circuit or cable.

sweep test A method to determine the frequency response of a cable, by generating an RF voltage whose frequency is varied at a rapid constant rate over a given range.

switchboard cable The cable used within and between the central office main frames and the switchboard.

tank test A voltage dielectric test in which the test sample is submerged in water and voltage is applied between the conductor and water as ground.

Glossary

tape wrap A spirally applied tape over an insulated or uninsulated wire.

TC Tray cable.

TC-ER Tray cable, extended run.

tear strength The force required to initiate or continue a tear in a material under specified conditions.

temperature coefficient of resistance The amount of resistance change of material per degree of temperature rise.

temperature rating The maximum and minimum temperature at which an insulating material may be used in continuous operation without loss of its basic properties.

Tempest Classified procedure which details the complex measurement of the combined reduction of all electromagnetic emissions from specified equipment.

tensile strength The pull stress required to break a given specimen.

TFE Polytetrafluoroethylene.

thermal shock A test to determine the ability of a material to withstand heat and cold by subjecting it to rapid and wide changes in temperature.

thermocouple A device for measuring temperature, at the point where two dissimilar metals are joined, and EMF output is generated when heated.

thermocouple element A thermocouple designed to be used as part of an assembly, but without associated parts such as the terminal block, connecting head, or protecting tube.

thermocouple extension cable A cable comprised of one or more twisted thermocouple extension wires under a common sheath.

thermocouple extension wire A pair of wires of dissimilar alloys having such EMF-temperature characteristics complimenting the thermocouple which is intended to be used, such that when properly connected allows the EMF to be faithfully transmitted to the reference junction.

thermocouple wire (grade) A pair of wires of dissimilar alloys having EMF-temperature characteristics calibrated to higher temperature levels than the extension type of thermocouple wire. Unlike the thermocouple extension wire, this wire may be employed as the thermocouple hot junction in addition to serving as the entire wire connection between hot and cold reference junctions.

thermoplastic A material which softens when heated or reheated and becomes firm on cooling.

thermoset A material which hardens or sets by heat, chemical or radiation cross-linking techniques and which, once set, cannot be resoftened by heating.

THHN 90°C, 600 volt, nylon jacketing building wire for dry locations.

THWN 75°C, 600 volt, nylon jacketed building wire for wet and dry locations.

tinned copper Tin coating added to copper to aid in soldering and inhibit corrosion.

topcoat conductor A conductor construction in which bare copper wires are first stranded and then coated with tin.

transformer A device for converting AC current from one voltage to another either “stepped up” or “stepped down.”

transmission cable Two or more transmission lines. If the structure is flat, it is sometimes called flat transmission cable to differentiate it from a round structure such as a jacketed group of coaxial cables. See transmission line.

transmission line A signal-carrying circuit with controlled electrical characteristics used to transmit high-frequency or narrow-pulse signals.

transmission loss The decrease or loss in power during transmission of energy from one point to another. Usually expressed in decibels.

tray A cable tray system is a unit or assembly of units or sections, and associated fittings, made of metal or other noncombustible materials forming a rigid structural system used to support cables. Cable tray systems (previously termed continuous rigid cable supports) include ladders, troughs, channels, solid bottom trays, and similar structures.

tray cable A factory-assembled multiconductor control, signal and power cable specifically approved under the National Electrical Code for installation of trays.

triad A group of 3 insulated conductors twisted together without (or with) a sheath overall. Usually color coded for identification. Also called triplex.

triaxial cable A cable construction having three coincident axes, such as conductor, first shield and second shield all insulated from one another.

Glossary

tubing A tube of extruded non-supported plastic or metallic material.

twinning Synonymous with pairing.

UF Thermoplastic underground feeder and branch circuit cable.

UHF Ultra high frequency, 300 to 3000 MHz.

UL Underwriters Laboratories, a nonprofit, independent organization, which operates a listing service for electrical and electronic materials and equipment.

UN Ungrounded neutral (refers to a type of power system).

unbalanced circuit A transmission line in which voltages on the two conductors are unequal with respect to ground; e.g. a coaxial cable.

unilay A conductor constructed with a central core surrounded by more than one layer of helically-laid strands, with all layers having a common length and direction of lay.

UTP Unshielded twisted pair cable.

UV Ultraviolet.

VDE German Society of Engineers that establishes standards and testing requirements.

velocity of propagation The speed of an electrical signal down a length of cable compared to speed in free space expressed as a percent. It is the reciprocal of the square root of the dielectric constant of the cable insulation.

VFD Variable-frequency drive.

VHF Very high frequency, 30 to 300 MHz.

volt A unit of electrical pressure. One volt is the electrical pressure that will cause one ampere of current to flow through one ohm of resistance.

voltage The term most often used in place of electromotive force, potential, potential difference, or voltage drop to designate the electric pressure that exists between two points and is capable of producing a current when a closed circuit is connected between two points.

voltage drop The amount of voltage loss from original input to point of electrical device.

voltage rating The highest voltage that may be continuously applied to a wire in conformance with standards or specifications.

voltage standing wave ratio (VSWR) The ratio of the maximum effective voltage to the minimum effective voltage measured along the length of a mismatched radio frequency transmission line.

volume resistivity (specific insulation resistance) The electrical resistance between opposite faces of a 1 cm cube.

VSWR Voltage standing wave ratio.

vulcanize To fuse under heat and pressure.

wall thickness The thickness of the applied insulation or jacket material.

water absorption Water by percent weight absorbed by a material after a given immersion period.

Watt (W) A unit of electric power. The watt is the power required to do work at the rate of one joule per second.

waveguide Hollow pipe (round or rectangular) used as transmission line for the propagation of microwaves.

wavelength The distance, measured in the direction of propagation, of a repetitive electrical pulse or waveform between two successive points.

wicking The longitudinal flow of a liquid in a wire or cable due to capillary action.

wire A slender rod or filament of drawn metal.

WTTC Wind turbine tray cable.

XLPE Cross-linked polyethylene.

Xtra-Guard® The Alpha Wire trade name for cable constructions designed for use in virtually any type of environment.

yield strength The minimum stress at which a material will start to physically deform without further increase in load.

Zipper Tubing™ Alpha Wire's trade name for a harnessing/jacketing material containing a zippertrack type closure. The zipper arrangement allows installation with no need to disconnect previously wired schemes for its installation. (See Loc-Trac®).