

## ● Cuponal Busbar Technical Data: AC/DC Current Ratings

NB. Check parameters to ensure compatibility of these current ratings with design specification. Recalculation graphs should be used for design conditions different than those stated. For compatibility, recalculation graphs computed for the same base parameters must be used with these tabulated values. These parameters are clearly stated in the table below.

### Parameters

The calculated values on this data sheet are based on the following parameters:

Ambient temperature °C	35	Supply frequency Hz	50
Busbar temperature °C	85	Emissivity	0.4
Temperature rise °C	50	Current ratings and recalculation graphs can be supplied for different specified parameters.	

n = number of bars in parallel

Current ratings assume still but unconfined air, with busbars mounted on edge.

Current ratings are based on "Temperature Rise of Busbars", H B Dwight; Gen. Elec. Rev., vol 43

For multiple bar arrangements, the space between the bars is equal to busbar thickness.

AC ratings are based on spacings at which the proximity effect is negligible.

These approximate calculated values should not be regarded as a substitute for experimental testing.

### Cuponal Rod 15% Cu/vol

Diameter	Area	Weight	DC Resistance at 20°C	DC Resistance at 85°C	Current Ratings (Amps): 50°C Rise Over 35°C Ambient	
					dc	ac
mm	mm <sup>2</sup>	kg/m	μOhm/m	μOhm/m		
5	19.63	0.071	1350	1701	89	89
6.3	31.17	0.113	850	1072	122	122
8	50.27	0.182	527	665	171	171
10	78.54	0.285	337	425	234	234
11	95.03	0.345	279	352	267	267
12	113.10	0.411	234	295	302	302
14	153.94	0.559	172	217	375	374
18	254.47	0.924	104	131	534	532
20	314.16	1.140	84	106	620	616
24	452.39	1.642	59	74	801	794
35	962.11	3.492	28	35	1364	1315
40	1256.64	4.562	21	27	1647	1551



**Cuponal Busbar Sections** 15% Cu/vol (unless stated otherwise)

Size	Corner radius	Area	Weight	DC Resistance at 20°C	DC Resistance at 85°C	Current Ratings (Amps): 50°C Rise Over 35°C Ambient							
						n=1		n=2		n=3		n=4	
mm	mm	mm <sup>2</sup>	kg/m	μOhm/m	μOhm/m	dc	ac	dc	ac	dc	ac	dc	ac
10x3	0.5	29.79	0.108	890	1122	131	131	249	249	367	367	485	485
20x3	0.5	59.79	0.217	443	559	231	231	427	427	622	620	816	812
25x3	0.5	74.79	0.271	354	447	280	280	512	512	743	740	973	968
10x4	0.5	39.79	0.144	666	840	157	157	303	303	449	449	595	593
16x4	1.5	62.07	0.225	427	538	224	224	423	423	621	619	819	815
20x4	1	79.14	0.287	335	422	272	272	507	507	742	738	976	970
25x4	1	99.14	0.36	267	337	328	328	606	605	882	877	1159	1149
30x4	1	119.14	0.432	222	280	383	383	702	700	1019	1012	1336	1323
40x4*	1	159.14	0.627	164	207	494	494	897	892	1296	1283	1695	1666
10x5	0.5	49.79	0.181	532	671	182	182	353	353	524	524	696	693
12x5	0.5	59.79	0.217	443	559	209	209	403	403	598	596	792	788
15x5	sq	75	0.272	353	445	248	248	474	474	700	697	926	920
20x5	1.5	98.07	0.356	270	341	309	309	582	580	854	849	1127	1118
20x5	sq	100	0.363	265	334	312	312	588	586	863	858	1138	1129
25x5	1.5	123.07	0.447	215	271	371	371	692	690	1012	1005	1332	1317
30x5	1.5	148.07	0.537	179	226	433	433	800	797	1166	1155	1532	1509
30x5	sq	150	0.545	177	223	436	436	806	802	1174	1163	1541	1518
40x5	1.5	198.07	0.719	134	169	553	552	1011	1003	1466	1444	1919	1871
40x5	sq	200	0.726	133	167	556	555	1016	1007	1473	1450	1929	1879
50x5*	1.5	248.07	0.977	105	133	677	674	1225	1209	1770	1729	2313	2223
60x5*	1.5	298.07	1.174	88	110	794	790	1428	1402	2057	1990	2683	2538
80x5*	1.5	398.07	1.568	66	83	1024	1014	1825	1773	2616	2473	3405	3108
20x6	2	116.57	0.423	227	287	343	343	653	650	961	955	1270	1257
25x6	2	146.57	0.532	181	228	412	412	774	770	1136	1125	1497	1475
28x6	2	164.57	0.597	161	203	453	452	846	841	1238	1224	1629	1600
30x6	2	176.57	0.641	150	189	479	479	893	887	1305	1289	1717	1682
40x6	2	236.57	0.859	112	141	611	610	1124	1112	1634	1601	2143	2068
50x6	2	296.57	1.077	89	113	741	737	1349	1326	1954	1893	2557	2422
60x6	2.5	354.63	1.287	75	94	866	860	1566	1529	2260	2162	2952	2742
75x6*	2	446.57	1.759	58	74	1064	1052	1909	1843	2745	2563	3579	3209
80x6*	2	476.57	1.878	55	69	1127	1112	2017	1940	2897	2684	3774	3348
120x6*	2	716.57	2.823	36	46	1617	1577	2857	2681	4080	3540	5297	4335
12x6.3	2	72.17	0.262	367	463	238	238	462	462	686	683	910	905
16x6.3	2	97.37	0.353	272	343	297	297	572	571	847	843	1122	1113
20x6.3	2	122.57	0.445	216	273	354	354	675	672	995	988	1315	1301
25x6.3	2	154.07	0.559	172	217	425	424	800	795	1174	1162	1548	1523
28x6.3	2	172.97	0.628	153	193	466	466	873	867	1279	1263	1684	1651
32x6.3	2	198.17	0.719	134	169	521	520	969	961	1416	1395	1862	1816
38x6.3	2	235.97	0.857	112	142	602	600	1112	1099	1619	1586	2125	2051
40x6.3	2	248.57	0.902	107	134	629	627	1158	1144	1685	1648	2211	2127
50x6.3	2	311.57	1.131	85	107	761	757	1389	1363	2013	1944	2635	2484
63x6.3	2	393.47	1.428	67	85	930	922	1682	1635	2428	2301	3171	2906
65x6.3*	2	406.07	1.6	64	81	964	954	1740	1688	2510	2368	3277	2983
80x6.3*	2	500.57	1.972	52	66	1157	1140	2073	1989	2979	2742	3883	3415
82x6.3*	2	513.17	2.022	51	64	1182	1165	2117	2028	3041	2789	3963	3469
100x6.3*	2	626.57	2.469	42	53	1410	1381	2508	2374	3592	3193	4672	3933
120x6.3*	2	752.57	2.965	35	44	1659	1616	2934	2742	4192	3604	5443	4409
16x8	0.25	127.95	0.464	207	261	353	353	686	683	1018	1011	1351	1335
20x8	2	156.57	0.568	169	213	413	413	797	792	1181	1169	1564	1539
25x8	2	196.57	0.714	135	170	492	491	939	930	1384	1364	1829	1784

\*20% Cu by volume



**Cuponal Busbar Sections** 15% Cu/vol (unless stated otherwise)

Size	Corner radius	Area	Weight	DC Resistance at 20°C	DC Resistance at 85°C	Current Ratings (Amps): 50°C Rise Over 35°C Ambient							
						n=1		n=2		n=3		n=4	
mm	mm	mm <sup>2</sup>	kg/m	μOhm/m	μOhm/m	dc	ac	dc	ac	dc	ac	dc	ac
30x8	2	236.57	0.859	112	141	570	569	1076	1063	1581	1549	2086	2013
34x8	2	268.57	0.975	99	124	631	629	1185	1167	1736	1691	2287	2187
40x8	2	316.57	1.149	84	106	722	719	1344	1319	1964	1895	2582	2430
50x8	2	396.57	1.44	67	84	872	864	1605	1560	2334	2211	3062	2803
60x8	2	476.57	1.73	56	70	1019	1006	1860	1791	2696	2502	3530	3140
75x8	2	596.57	2.166	44	56	1236	1213	2235	2122	3226	2900	4215	3595
80x8	2	636.57	2.311	42	52	1307	1281	2359	2228	3401	3023	4440	3736
90x8	2	716.57	2.601	37	47	1449	1414	2603	2436	3745	3260	4884	4011
100x8	2	796.57	2.892	33	42	1590	1545	2845	2640	4086	3483	5323	4274
10x10	sq	100	0.363	265	334	298	298	583	582	867	862	1152	1143
12x10	1	119.14	0.432	222	280	335	335	654	652	973	967	1292	1279
12x12	sq	144	0.523	184	232	385	385	753	749	1121	1111	1489	1467
15x10	1	149.14	0.541	178	224	391	391	762	759	1133	1123	1504	1481
15x10	sq	150	0.545	177	223	392	392	765	761	1136	1126	1508	1486
20x10	3	192.27	0.698	138	174	474	473	921	913	1368	1348	1814	1771
20x10	sq	200	0.726	133	167	483	482	939	931	1395	1374	1850	1803
25x10	3	242.27	0.879	109	138	563	561	1086	1073	1609	1575	2132	2055
25x10	sq	250	0.908	106	134	572	570	1104	1089	1635	1598	2166	2082
30x10	3	292.27	1.061	91	114	650	647	1242	1220	1833	1777	2424	2300
30x10	sq	300	1.089	88	111	659	655	1258	1236	1857	1798	2456	2325
40x10	3	392.27	1.424	68	85	821	814	1544	1501	2265	2148	2985	2736
40x10	sq	400	1.452	66	84	829	821	1559	1514	2287	2165	3014	2755
50x10	3	492.27	1.787	54	68	988	975	1837	1764	2682	2478	3526	3118
50x10	sq	500	1.815	53	67	996	982	1851	1776	2703	2493	3553	3133
60x10	3	592.27	2.15	45	56	1152	1132	2123	2013	3088	2779	4052	3461
60x10	sq	600	2.178	44	56	1160	1139	2137	2024	3108	2791	4078	3474
63x10	3	622.27	2.259	43	54	1201	1178	2208	2085	3208	2864	4208	3557
75x10	3	742.27	2.694	36	45	1395	1359	2543	2367	3683	3184	4821	3929
80x10	3	792.27	2.876	33	42	1475	1434	2681	2481	3879	3310	5073	4079
80x10	sq	800	2.904	33	42	1482	1440	2694	2490	3898	3320	5098	4090
100x10	3	992.27	3.602	27	34	1791	1723	3226	2920	4647	3786	6064	4654
100x10	sq	1000	3.63	27	33	1798	1729	3238	2929	4665	3794	6088	4665
120x10	3	1192.27	4.328	22	28	2103	2003	3760	3341	5399	4234	7033	5194
18x12	sq	216	0.784	123	155	507	506	988	979	1469	1444	1950	1892
20x12	3	232.27	0.843	114	144	538	536	1047	1036	1556	1525	2065	1996
24x12	sq	288	1.045	92	116	625	622	1215	1194	1804	1750	2393	2274
30x12	sq	360	1.307	74	93	739	734	1427	1393	2115	2021	2802	2598
40x12	3	472.27	1.714	56	71	918	907	1744	1678	2568	2387	3392	3021
42x12	sq	504	1.83	53	66	963	950	1823	1747	2682	2471	3540	3118
50x12	3	592.27	2.15	45	56	1101	1082	2066	1956	3028	2724	3988	3406
60x12	3	712.27	2.586	37	47	1281	1251	2380	2217	3475	3028	4568	3755
100x12	3	1192.27	4.328	22	28	1981	1885	3591	3164	5187	4068	6779	5007
120x12	3	1432.27	5.199	19	23	2323	2184	4177	3604	6012	4538	7842	5571
63x12.5	3	779.77	2.831	34	43	1367	1330	2538	2341	3705	3172	4869	3928
24x15	sq	360	1.307	74	93	727	722	1416	1383	2106	2012	2795	2591
40x15	3	592.27	2.15	45	56	1058	1039	2035	1925	3011	2709	3986	3405
50x15	3	742.27	2.694	36	45	1263	1231	2397	2216	3529	3051	4661	3798
60x15	3	892.27	3.239	30	37	1464	1414	2750	2488	4033	3360	5314	4169
120x15	3	1792.27	6.506	15	19	2628	2423	4763	3942	6881	4954	8994	6086
32x16	3	504.27	1.831	53	66	930	918	1809	1734	2688	2476	3566	3140

\*20% Cu by volume

# Recalculation Graphs for Alternative Conditions

## Use of Recalculation Graphs

### Alternative Temperature Conditions

Obtain correction factor  $F_c$  from the graph as follows:  
 1. Locate isotherm for new ambient temperature  
 2. Locate new busbar operating temperature on x-axis  
 3. Read correction factor  $F_c$  from y-axis

### Typical emissivities for copper surfaces:

Bright metal	0.1
Partly oxidised	0.3
Heavily oxidised	0.7
Dull non-metallic paint	0.9

### Alternative Emissivity Condition

Obtain temperature factor  $k$  as follows:  
 1. If temperature parameters are unchanged.  $k = 1$   
 2. Otherwise, locate isothermal for new ambient temperature  
 3. Locate new bus bar operating temperature on x-axis  
 4. Read temperature factor  $k$  from y-axis  
 5. Calculate temperature factor  $k \times$  busbar height  $h$   
 Obtain correction factor  $F_e$  as follows:  
 1. Locate line of constant emissivity for the new condition  
 2. Locate  $k \cdot h$  on the x-axis  
 3. Read correction factor  $F_e$  from y-axis

NB. Recalculation factors may be determined from the graphs on this data sheet to correct tabulated Cuponal current ratings for different design parameters. For compatibility, these recalculation graphs must only be used with tabulated values computed for the same base parameters. These parameters are clearly stated in the tables on page 1 of this data sheet.

### Correction Factor Example

Size	100x10	$F_c$	0.75
Bar height	100	$k$	1.14
New ambient temperature °C	35	$k \cdot h$	114
New busbar temperature °C	65	$F_e$	1.00
New emissivity	0.4	$F = F_e \cdot F_c$	0.75
$I_{dc}$ (from table)	1798	New $I_{dc}$	1357
$I_{ac}$ (from table)	1729	New $I_{ac}$	1305

### Alternative Supply Frequency

Obtain correction factor  $F_s$  as follows:  
 1. Calculate  $X$  using the following formula:

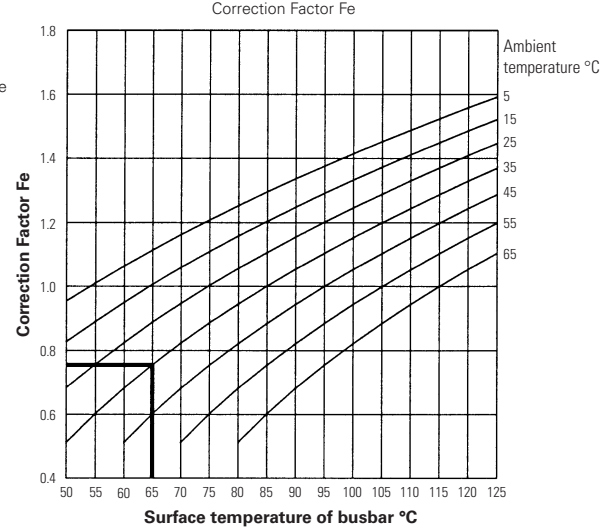
$$X = \sqrt{\frac{A \times f}{26.5[1 + 0.00401(T_s - 20)]}}$$

$f$  = new supply frequency, Hz  
 $A$  = area of busbar, mm<sup>2</sup>  
 $T_s$  = new busbar temperature, °C

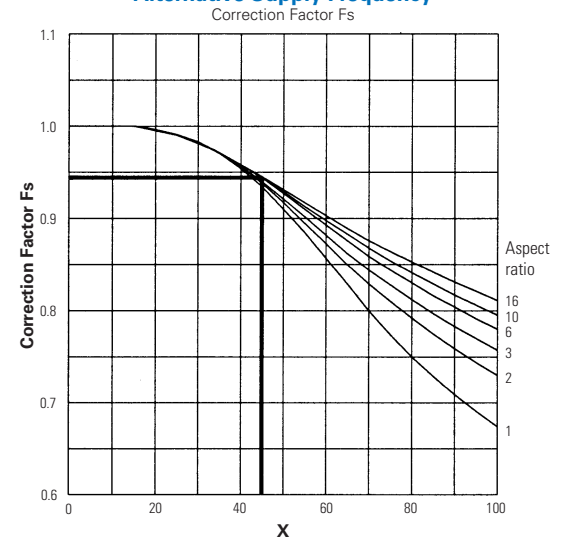
- Locate aspect ratio line for busbar size (use AR=1 for round bar)
- Locate calculated  $X$  value on the x-axis
- Read correction factor  $F_s$  from y-axis
- Use  $F_s$  with  $I_{dc}$  values to compute  $I_{ac}$  ie New  $I_{ac} = I_{dc}$  for condition  $x F_s$

New supply frequency Hz	60	AR	10
$X$ (from formula)	43.80	$F_s$	0.948
Corrected $I_{dc}$ (from above)	1357	New $I_{ac}$	1287

### Alternative Temperature Conditions



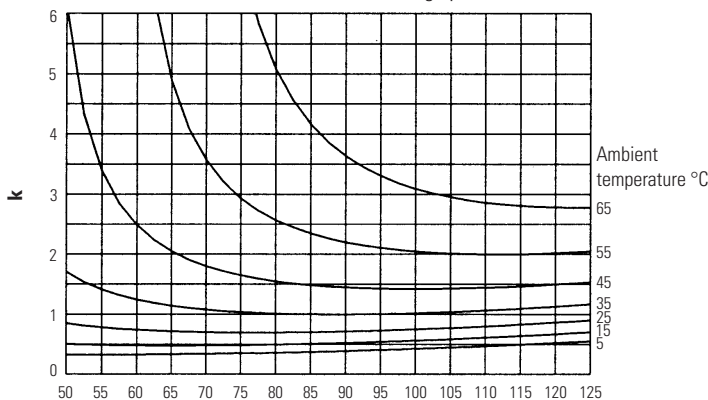
### Alternative Supply Frequency



### Alternative Emissivity Condition

#### Temperature Factor k

For use in Correction Factor  $F_e$  graph



NB  $k = 1$  if no change in temperature parameters

#### Correction Factor Fe

