

# ELEKTRISOLA

## HTCCA

### High Tension Copper Clad Aluminum

#### General Description

The ELEKTRISOLA high tension copper clad aluminum wire (HTCCA) is a bimetallic compound consisting of an aluminum alloy core and a concentric copper cladding. This combination provides a wire with all the advantages of a copper clad aluminum wire (CCA) paired with a much higher tensile strength. This increased hardness of the HTCCA makes it a preferred choice for applications under dynamic load. HTCCA is therefore optimal for high quality coils such as used in mobile phones, headphones, headsets and loudspeakers where wire breaks are feared.

#### Features

- Low density allows coil weight reduction
- Easy soldering due to copper cladding
- Higher tensile strength compared to normal CCA. Same tensile strength to copper wire.
- High conductivity

#### Applications

- Mobile phone receiver
- Voice coils ( in headphone, headset, ...)
- VCM coils for HDD actuator
- Loudspeaker

#### Electrical Characteristics (Note 1)

Symbol	Parameter	Min (Note 3)	Typ (Note 2)	Max (Note 3)	Units
$\chi$	Conductivity		35.5		S*m/mm <sup>2</sup>
$\rho$	Resistivity		0.0282		$\Omega$ *mm <sup>2</sup> /m
$\alpha$	Thermal coefficient of resistance	3800	4000	4200	10E-6/K
	Resistance (IACS)		61		%

#### Mechanical Characteristics (Note 1)

Symbol	Parameter	Min (Note 3)	Typ (Note 2)	Max (Note 3)	Units
$\sigma_T$	Tensile strength	220	250	280	N/mm <sup>2</sup>
$\sigma_{Y1\%}$	Yield strength at 1%	170	215	260	N/mm <sup>2</sup>
$\varepsilon$	Elongation	4	8	15	%
<i>BPP</i>	Bending proof performance (Note 4)		100		%

#### Physical Characteristics (Note 1)

Symbol	Parameter	Min (Note 3)	Typ (Note 2)	Max (Note 3)	Units
$\rho$	Density		3.6		kg/dm <sup>3</sup>
<i>CC</i>	Copper cladding in percentage of cross-section		15		%

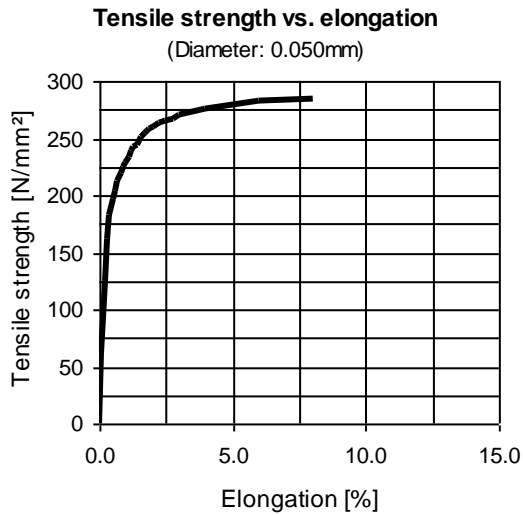
**Note 1:** Unless otherwise specified, all limits are guaranteed for annealed and enameled wire at  $T_A = 20^\circ\text{C}$  and measured according international standard IEC 851 as far as applicable.

**Note 2:** Typical Values represent the most likely parametric norm.

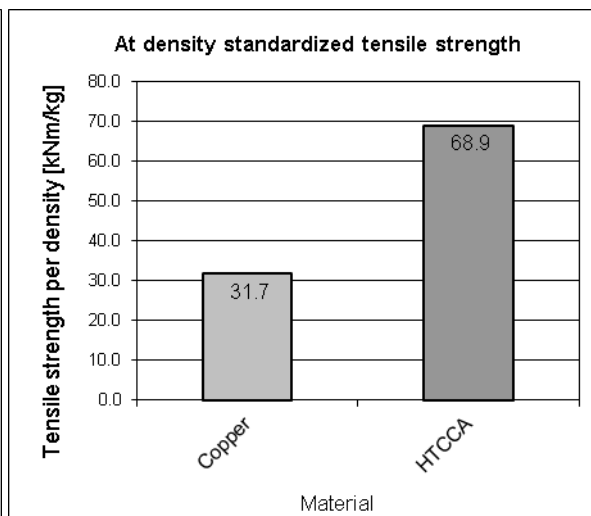
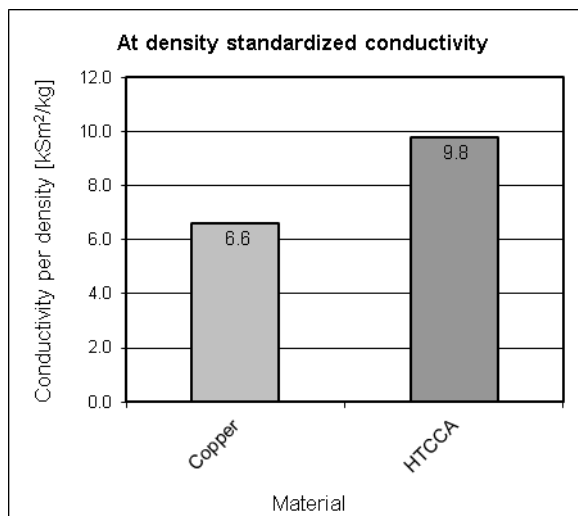
**Note 3:** All limits are guaranteed by testing or statistical analysis.

**Note 4:** BPP tests are conducted with a 0.050mm annealed and enameled wire according ELEKTRISOLA internal specification. The value specifies the Time To Fracture (TTF) compared to copper (100%) under these test conditions.

## Typical Performance Characteristics



## High Tension CCA vs. Copper



### BANNED SUBSTANCES COMPLIANCE

ELEKTRISOLA FEINDRAHT AG certifies that the products and packing materials meet the provision from the European Union for the Restriction of certain Hazardous Substances (RoHS) and the directive for Waste from Electrical and Electronic Equipment (WEEE).

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## Annex A

### Electrical Resistance

The limits of electrical resistance are derived from the calculations made in IEC standard 317-0-1 Annex C.1 "Method for the calculation of linear resistance" for copper wire and are restricted by a factor of 2.

Nom. Diameter [mm]	AWG	Min [ $\Omega/m$ ]	Nominal [ $\Omega/m$ ]	Max [ $\Omega/m$ ]	Nom. Diameter [mm]	AWG	Min [ $\Omega/m$ ]	Nominal [ $\Omega/m$ ]	Max [ $\Omega/m$ ]
0.0098	58	340.9	378.8	416.7	0.0430		17.77	19.67	21.58
0.0101		321.0	356.6	392.3	0.0437		17.20	19.05	20.90
0.0109	57	275.6	306.2	336.8	0.0440	45	16.97	18.79	20.61
0.0113		256.4	284.9	313.4	0.0450		16.22	17.96	19.71
0.0120		227.4	252.6	277.9	0.0460		15.52	17.19	18.86
0.0125	56	209.5	232.8	256.1	0.0470	44.5	14.99	16.47	17.95
0.0130	55.5	193.7	215.3	236.8	0.0480		14.37	15.79	17.21
0.0135	55	179.6	199.6	219.6	0.0490		13.79	15.15	16.51
0.0140		167.0	185.6	204.2	0.0500	44	13.24	14.55	15.86
0.0145	54.5	155.7	173.0	190.3	0.0520	43.5	12.24	13.45	14.66
0.0155	54	136.3	151.4	166.6	0.0530		11.79	12.95	14.12
0.0160		127.9	142.1	156.3	0.0550	43	10.94	12.03	13.11
0.0165	53.5	120.3	133.6	147.0	0.0560		10.56	11.60	12.64
0.0170		113.3	125.9	138.5	0.0580		9.841	10.81	11.79
0.0175	53	106.9	118.8	130.7	0.0600	42.5	9.297	10.11	10.91
0.0180		101.1	112.3	123.5	0.0620		8.707	9.464	10.22
0.0185	52.5	95.66	106.3	116.9	0.0630	42	8.432	9.166	9.899
0.0190		90.69	100.8	110.8	0.0650	41.5	7.800	8.610	9.545
0.0195	52	86.10	95.67	105.2	0.0670		7.361	8.104	8.957
0.0200		81.85	90.95	100.0	0.0680		7.155	7.867	8.684
0.0210	51.5	74.24	82.49	90.74	0.0700	41	6.768	7.424	8.173
0.0215		70.83	78.70	86.57	0.0710		6.586	7.216	7.935
0.0220	51	67.65	75.16	82.68	0.0740		6.083	6.643	7.278
0.0230	50.5	61.89	68.77	75.64	0.0750	40.5	5.928	6.467	7.077
0.0240		56.84	63.16	69.47	0.0780	40	5.497	5.979	6.523
0.0245	50	54.54	60.61	66.67	0.0800		5.235	5.684	6.188
0.0250		52.38	58.21	64.03	0.0830	39.5	4.877	5.281	5.733
0.0260	49.5	48.43	53.81	59.20	0.0850		4.657	5.035	5.456
0.0270		44.91	49.90	54.89	0.0880	39	4.355	4.698	5.078
0.0275	49	43.29	48.10	52.91	0.0900		4.170	4.491	4.847
0.0280		41.76	46.40	51.04	0.0930	38.5	3.914	4.206	4.530
0.0290	48.5	38.93	43.26	47.58	0.0950		3.755	4.031	4.335
0.0300		36.38	40.42	44.46	0.1000		3.400	3.638	3.899
0.0310	48	34.07	37.85	41.64	0.101	38.0	3.335	3.566	3.820
0.0320		31.97	35.53	39.08	0.106	37.5	3.036	3.238	3.458
0.0330	47.5	30.16	33.41	36.65	0.110		2.825	3.006	3.205
0.0340		28.42	31.47	34.52	0.112		2.727	2.900	3.088
0.0350	47	26.82	29.70	32.58	0.113	37	2.680	2.849	3.032
0.0360		25.35	28.07	30.79	0.115		2.590	2.751	2.925
0.0370	46.5	24.00	26.57	29.15	0.118	36.5	2.463	2.613	2.774
0.0380		22.75	25.19	27.64	0.120		2.384	2.526	2.680
0.0381		22.63	25.06	27.49	0.125		2.201	2.328	2.465
0.0390	46.0	21.60	23.92	26.24	0.126	36	2.167	2.291	2.425
0.0400		20.53	22.74	24.94	0.130		2.039	2.153	2.275
0.0410	45.5	19.54	21.64	23.74	0.132		1.979	2.088	2.205
0.0420		18.62	20.62	22.62	0.134	35.5	1.922	2.026	2.138

## Annex A

### Electrical Resistance (Continued)

Nom. Diameter [mm]	AWG	Min [ $\Omega/m$ ]	Nominal [ $\Omega/m$ ]	Max [ $\Omega/m$ ]	Nom. Diameter [mm]	AWG	Min [ $\Omega/m$ ]	Nominal [ $\Omega/m$ ]	Max [ $\Omega/m$ ]
0.138		1.814	1.910	2.013	0.270		0.4804	0.4990	0.5185
0.140		1.764	1.856	1.955	0.280		0.4472	0.4640	0.4816
0.141	35	1.739	1.830	1.927	0.286	29	0.4289	0.4447	0.4614
0.149	34.5	1.561	1.639	1.721	0.290		0.4173	0.4326	0.4485
0.150		1.541	1.617	1.698	0.295		0.4034	0.4180	0.4333
0.159	34.0	1.374	1.439	1.508	0.300		0.3903	0.4042	0.4187
0.160		1.357	1.421	1.488	0.301	28.5	0.3877	0.4015	0.4159
0.169	33.5	1.219	1.274	1.331	0.315		0.3544	0.3666	0.3793
0.170		1.205	1.259	1.316	0.319	28	0.3457	0.3575	0.3698
0.179	33	1.089	1.135	1.184	0.335		0.3138	0.3242	0.3349
0.180		1.077	1.123	1.171	0.339	27.5	0.3066	0.3166	0.3269
0.189		0.9784	1.018	1.061	0.345		0.2961	0.3056	0.3155
0.190	32.5	0.9683	1.008	1.049	0.350		0.2878	0.2970	0.3065
0.200		0.8752	0.9095	0.9454	0.355		0.2798	0.2887	0.2978
0.202	32	0.8582	0.8915	0.9265	0.360	27	0.2707	0.2807	0.2911
0.210		0.7950	0.8249	0.8562	0.375		0.2498	0.2587	0.2680
0.212	31.5	0.7803	0.8094	0.8399	0.380	26.5	0.2433	0.2519	0.2609
0.220		0.7253	0.7516	0.7791	0.383		0.2396	0.2480	0.2568
0.222		0.7124	0.7381	0.7650	0.390		0.2312	0.2392	0.2475
0.224		0.6999	0.7250	0.7512	0.400		0.2199	0.2274	0.2351
0.225	31	0.6878	0.7186	0.7512	0.402	26	0.2177	0.2251	0.2328
0.230		0.6587	0.6877	0.7183	0.420		0.1997	0.2062	0.2130
0.236		0.6262	0.6532	0.6817	0.425		0.1951	0.2014	0.2080
0.239		0.6108	0.6369	0.6644	0.427	25.5	0.1933	0.1995	0.2060
0.240	30.5	0.6058	0.6316	0.6587	0.450		0.1742	0.1796	0.1853
0.250		0.5590	0.5821	0.6063	0.453	25	0.1719	0.1773	0.1828
0.253	30	0.5461	0.5683	0.5918	0.475		0.1565	0.1612	0.1661
0.260		0.5175	0.5381	0.5598	0.481	24.5	0.1527	0.1572	0.1619
0.265		0.4984	0.5180	0.5386	0.500		0.1414	0.1455	0.1497
0.268	29.5	0.4875	0.5065	0.5264	0.508	24	0.1365	0.1410	0.1456