

ELEKTRISOLA

CuNi44

Copper Nickel Alloy (Constantan)

General Description

Due to its high tensile strength and resistance values, ELEKTRISOLA copper nickel alloy wires are the first choice for applications as resistance wires. With the different nickel content of our products, the characteristics of the wire can be chosen according to your requirements. Copper nickel alloy wires are available in diameters from 0.030mm to 0.500mm (AWG 48 – 24) as bare wire, or enameled wire with any insulation and self-bonding enamel. Furthermore litz wire made of enameled copper nickel alloy wire are available.

Features

- Very low thermal coefficient of resistance
- Higher resistance than copper
- High tensile strength
- Good bending proof performance

Applications

- Heating applications
- Resistance wire
- Precision and measurement applications
- Applications with high mechanical requirements
- Others

Electrical Characteristics (Note 1)

Symbol	Parameter	Min (Note 3)	Typ (Note 2)	Max (Note 3)	Units
χ	Conductivity		2.0		S*m/mm ²
ρ	Resistivity		0.5000		Ω *mm ² /m
α	Thermal coefficient of resistance	-80	0	40	10E-6/K
	Resistance (IACS)		3		%

Mechanical Characteristics (Note 1)

Symbol	Parameter	Min (Note 3)	Typ (Note 2)	Max (Note 3)	Units
σ_T	Tensile strength	560	620	680	N/mm ²
$\sigma_{Y1\%}$	Yield strength at 1%	400	450	500	N/mm ²
ε	Elongation	14	19	24	%
<i>BPP</i>	Bending proof performance (Note 4)		<i>in preparation</i>		%

Physical Characteristics (Note 1)

Symbol	Parameter	Min (Note 3)	Typ (Note 2)	Max (Note 3)	Units
ρ	Density		8.9		kg/dm ³

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 evaluated by testing or statistical analysis but are not guaranteed.

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.

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).

ELEKTRISOLA FEINDRAHT AG
Hauptstrasse 35, PO Box 177
CH - 6182 Escholzmatt
Switzerland

Telephone +41 (0)41 487 77 00
Fax +41 (0)41 487 78 00
E-Mail info@elektrisola.ch
Internet www.elektrisola.ch

Sister Companies: ELEKTRISOLA Dr. Gerd Schildbach, Germany
ELEKTRISOLA GmbH, Italy
ELEKTRISOLA Inc., USA
ELEKTRISOLA Sdn. Bhd., Malaysia
ELEKTRISOLA SA, México
ELEKTRISOLA Hangzhou, China

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 [Ω/m]	Nominal [Ω/m]	Max [Ω/m]	Nom. Diameter [mm]	AWG	Min [Ω/m]	Nominal [Ω/m]	Max [Ω/m]
0.0098	58	5966	6629	7292	0.0430		310.9	344.3	377.7
0.0101		5617	6241	6865	0.0437		301.0	333.4	365.7
0.0109	57	4822	5358	5894	0.0440	45	296.9	328.8	360.7
0.0113		4487	4986	5484	0.0450		283.9	314.4	344.9
0.0120		3979	4421	4863	0.0460		271.7	300.9	330.0
0.0125	56	3667	4074	4482	0.0470	44.5	262.3	288.2	314.1
0.0130	55.5	3390	3767	4144	0.0480		251.4	276.3	301.2
0.0135	55	3144	3493	3842	0.0490		241.3	265.1	289.0
0.0140		2923	3248	3573	0.0500	44	231.7	254.6	277.6
0.0145	54.5	2725	3028	3331	0.0520	43.5	214.2	235.4	256.6
0.0155	54	2385	2650	2915	0.0530		206.2	226.6	247.0
0.0160		2238	2487	2735	0.0550	43	191.5	210.5	229.4
0.0165	53.5	2105	2338	2572	0.0560		184.7	203.0	221.3
0.0170		1983	2203	2423	0.0580		172.2	189.2	206.3
0.0175	53	1871	2079	2287	0.0600	42.5	162.7	176.8	191.0
0.0180		1768	1965	2161	0.0620		152.4	165.6	178.9
0.0185	52.5	1674	1860	2046	0.0630	42	147.6	160.4	173.2
0.0190		1587	1763	1940	0.0650	41.5	136.5	150.7	167.0
0.0195	52	1507	1674	1842	0.0670		128.8	141.8	156.8
0.0200		1432	1592	1751	0.0680		125.2	137.7	152.0
0.0210	51.5	1299	1444	1588	0.0700	41	118.4	129.9	143.0
0.0215		1239	1377	1515	0.0710		115.3	126.3	138.9
0.0220	51	1184	1315	1447	0.0740		106.5	116.3	127.4
0.0230	50.5	1083	1203	1324	0.0750	40.5	103.7	113.2	123.9
0.0240		994.7	1105	1216	0.0780	40	96.20	104.6	114.1
0.0245	50	954.5	1061	1167	0.0800		91.62	99.47	108.3
0.0250		916.7	1019	1120	0.0830	39.5	85.34	92.41	100.3
0.0260	49.5	847.6	941.7	1036	0.0850		81.51	88.11	95.49
0.0270		786.0	873.3	960.6	0.0880	39	76.22	82.21	88.87
0.0275	49	757.6	841.8	926.0	0.0900		72.98	78.60	84.83
0.0280		730.8	812.0	893.2	0.0930	38.5	68.49	73.61	79.27
0.0290	48.5	681.3	757.0	832.7	0.0950		65.72	70.54	75.86
0.0300		636.6	707.4	778.1	0.1000		59.49	63.66	68.24
0.0310	48	596.2	662.5	728.7	0.101	38.0	58.36	62.41	66.85
0.0320		559.5	621.7	683.9	0.106	37.5	53.13	56.66	60.52
0.0330	47.5	527.9	584.6	641.3	0.110		49.43	52.61	56.08
0.0340		497.3	550.7	604.1	0.112		47.73	50.75	54.04
0.0350	47	469.3	519.7	570.1	0.113	37	46.91	49.86	53.06
0.0360		443.6	491.2	538.9	0.115		45.33	48.14	51.18
0.0370	46.5	419.9	465.0	510.1	0.118	36.5	43.11	45.72	48.55
0.0380		398.1	440.9	483.6	0.120		41.72	44.21	46.90
0.0381	46.1	396.0	438.6	481.1	0.125		38.52	40.74	43.14
0.0390	46.0	378.0	418.6	459.2	0.126	36	37.93	40.10	42.44
0.0400		359.3	397.9	436.5	0.130		35.68	37.67	39.81
0.0410	45.5	342.0	378.7	415.5	0.132		34.63	36.54	38.58
0.0420		325.9	360.9	395.9	0.134	35.5	33.63	35.45	37.41

Annex A

Electrical Resistance (Continued)

Nom. Diameter [mm]	AWG	Min [Ω /m]	Nominal [Ω /m]	Max [Ω /m]
0.138		31.75	33.43	35.23
0.140		30.87	32.48	34.21
0.141	35	30.44	32.02	33.71
0.149	34.5	27.32	28.68	30.12
0.150		26.96	28.29	29.71
0.159	34.0	24.05	25.18	26.38
0.160		23.76	24.87	26.05
0.169	33.5	21.34	22.29	23.30
0.170		21.09	22.03	23.02
0.179	33	19.06	19.87	20.73
0.180		18.85	19.65	20.49
0.189		17.12	17.82	18.56
0.190	32.5	16.94	17.63	18.36
0.200		15.32	15.92	16.54
0.202	32	15.02	15.60	16.21
0.210		13.91	14.44	14.98
0.212	31.5	13.65	14.16	14.70
0.220		12.69	13.15	13.64
0.222		12.47	12.92	13.39
0.224		12.25	12.69	13.15
0.225	31	12.04	12.58	13.15
0.230		11.53	12.03	12.57
0.236		10.96	11.43	11.93
0.239		10.69	11.15	11.63
0.240	30.5	10.60	11.05	11.53
0.250		9.783	10.19	10.61
0.253	30	9.556	9.946	10.36
0.260		9.056	9.417	9.797
0.265		8.723	9.065	9.425
0.268	29.5	8.531	8.864	9.212

Nom. Diameter [mm]	AWG	Min [Ω /m]	Nominal [Ω /m]	Max [Ω /m]
0.270		8.407	8.733	9.074
0.280		7.826	8.120	8.429
0.286	29	7.505	7.783	8.074
0.290		7.302	7.570	7.850
0.295		7.060	7.315	7.582
0.300		6.830	7.074	7.328
0.301	28.5	6.785	7.027	7.279
0.315		6.203	6.416	6.638
0.319	28	6.050	6.256	6.471
0.335		5.492	5.673	5.860
0.339	27.5	5.365	5.540	5.721
0.345		5.182	5.349	5.522
0.350		5.037	5.197	5.363
0.355		4.897	5.052	5.211
0.360	27	4.738	4.912	5.095
0.375		4.371	4.527	4.690
0.380	26.5	4.258	4.409	4.566
0.383		4.193	4.340	4.494
0.390		4.045	4.186	4.332
0.400		3.848	3.979	4.115
0.402	26	3.810	3.939	4.074
0.420		3.494	3.609	3.728
0.425		3.414	3.525	3.640
0.427	25.5	3.382	3.492	3.605
0.450		3.049	3.144	3.242
0.453	25	3.009	3.102	3.199
0.475		2.739	2.822	2.907
0.481	24.5	2.672	2.752	2.834
0.500		2.475	2.546	2.620
0.508	24	2.389	2.467	2.548