

Resistance Wire for Low Temp Heating or Resistors Nickel-Copper Alloy - 294

$$I = \text{Current}$$

$$C_t = \text{Temperature factor}$$

$$p = \text{Surface load W/in}^2$$

$$I^2 C_t / p = \text{in}^2 / \Omega$$

Common Names: Cuprothal®, Alloy 294, Cuprothal® 294, Nico®, MWS-294, Cupron®, Copel®, Alloy 45, Neutrology, Advance, CuNi 102, Cu-Ni 44, Konstantan®

Uses: Motor control, heating wires and cables; precision and vitreous resistors, potentiometers.

Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
45%	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	55%	None/Trace	None/Trace	None/Trace	None/Trace

Technical Data

Resistivity (Ω/cm)	294	Resistivity (Ω/sqmf)	230
Resistivity (μΩ/cm)	48.88	Nom. Temp. Coeff. of Resistance (TCR)	0.00002
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu	-0.045	Specific Heat (20°C)	0.094 cal/g
Density (g/cm³)	8.90	Density (lb/in³)	0.3218
Thermal Conductivity	0.21 W/cm/°C	Coeff. of Linear Expansion (X 10⁻⁶)	14.90 in/in/°C
Approx. Melting Point	1205°C	Max. Continuous Operating Temp.	400°C
UTS – Hard (KPSI)	135	YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)	110	YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	60	YTS Tensile – Annealed (KPSI)	
Magnetic Attraction	None	Emissivity – fully oxidized	
Designations/Specifications	ASTM-B267	Forms Available	Wire, Ribbon

Alloy Data

Gage AWG	Diameter Inch	Resistance at 68° F Ω/ft	Resistance at 68° F Ω/lb	Weight lb/1000 ft	Surface area in²/ft	in²/Ω at 68°F
000	0.4096	0.0018	0.0034	508.9731	15.4432	8814.5387
00	0.3648	0.0022	0.0055	403.6335	13.7525	6224.9813
0	0.3249	0.0028	0.0087	320.0954	12.2470	4396.1907
1	0.2893	0.0035	0.0138	253.8469	10.9062	3104.6667
2	0.2576	0.0044	0.0220	201.3094	9.7123	2192.5699
3	0.2294	0.0056	0.0350	159.6454	8.6490	1548.4312
4	0.2043	0.0070	0.0556	126.6044	7.7022	1093.5292
5	0.1819	0.0089	0.0885	100.4017	6.8590	772.2694
6	0.1620	0.0112	0.1407	79.6220	6.1081	545.3902
7	0.1443	0.0141	0.2237	63.1431	5.4394	385.1641
8	0.1285	0.0178	0.3556	50.0747	4.8439	272.0096
9	0.1144	0.0225	0.5655	39.7109	4.3136	192.0979
10	0.1019	0.0283	0.8991	31.4922	3.8414	135.6629
11	0.0907	0.0357	1.4297	24.9744	3.4209	95.8075
12	0.0808	0.0450	2.2733	19.8056	3.0464	67.6610
13	0.0720	0.0568	3.6147	15.7065	2.7129	47.7833
13.5	0.0679	0.0638	4.5581	13.9870	2.5601	40.1556
14	0.0641	0.0716	5.7476	12.4558	2.4159	33.7454
14.5	0.0605	0.0804	7.2476	11.0922	2.2798	28.3586
15	0.0571	0.0903	9.1391	9.8779	2.1514	23.8316
15.5	0.0539	0.1014	11.5242	8.7965	2.0302	20.0273
16	0.0508	0.1138	14.5318	7.8335	1.9159	16.8303
16.5	0.0480	0.1278	18.3243	6.9759	1.8080	14.1436
17	0.0453	0.1435	23.1065	6.2122	1.7061	11.8859
17.5	0.0427	0.1612	29.1368	5.5322	1.6100	9.9885
18	0.0403	0.1810	36.7409	4.9265	1.5194	8.3940
18.5	0.0380	0.2033	46.3295	4.3872	1.4338	7.0540
19	0.0359	0.2282	58.4205	3.9069	1.3530	5.9280
19.5	0.0339	0.2563	73.6669	3.4792	1.2768	4.9817

Gage AWG	Diameter Inch	Resistance at 68° F Ω/ft	Resistance at 68° F Ω/lb	Weight Lb/1000 ft	Surface area in ² /ft	in ² /Ω at 68°F
20	0.0320	0.2878	92.8924	3.0983	1.2049	4.1864
20.5	0.0302	0.3232	117.1353	2.7591	1.1370	3.5182
21	0.0285	0.3629	147.7052	2.4571	1.0730	2.9565
21.5	0.0269	0.4075	186.2530	2.1881	1.0126	2.4846
22	0.0253	0.4576	234.8611	1.9485	0.9555	2.0880
22.5	0.0239	0.5139	296.1548	1.7352	0.9017	1.7547
23	0.0226	0.5771	373.4448	1.5453	0.8509	1.4746
23.5	0.0213	0.6480	470.9059	1.3761	0.8030	1.2392
24	0.0201	0.7277	593.8022	1.2254	0.7578	1.0414
24.5	0.0190	0.8171	748.7718	1.0913	0.7151	0.8751
25	0.0179	0.9176	944.1852	0.9718	0.6748	0.7354
25.5	0.0169	1.0304	1190.5972	0.8654	0.6368	0.6180
26	0.0159	1.1570	1501.3176	0.7707	0.6009	0.5194
26.5	0.0150	1.2993	1893.1292	0.6863	0.5671	0.4365
27	0.0142	1.4590	2387.1953	0.6112	0.5351	0.3668
27.5	0.0134	1.6384	3010.2019	0.5443	0.5050	0.3082
28	0.0126	1.8398	3795.8000	0.4847	0.4766	0.2590
29	0.0113	2.3199	6035.5757	0.3844	0.4244	0.1829
30	0.0100	2.9254	9596.9687	0.3048	0.3779	0.1292
31	0.0089	3.6888	15259.8217	0.2417	0.3366	0.0912
32	0.0080	4.6516	24264.1364	0.1917	0.2997	0.0644
33	0.0071	5.8655	38581.5985	0.1520	0.2669	0.0455
34	0.0063	7.3963	61347.3202	0.1206	0.2377	0.0321
35	0.0056	9.3266	97546.3393	0.0956	0.2117	0.0227
36	0.0050	11.7606	155105.1989	0.0758	0.1885	0.0160
37	0.0045	14.8298	246627.6326	0.0601	0.1679	0.0113
38	0.0040	18.7001	392154.4190	0.0477	0.1495	0.0080
39	0.0035	23.5804	623551.7355	0.0378	0.1331	0.0056
40	0.0031	29.7344	991488.9340	0.0300	0.1185	0.0040
41	0.0028	37.4945	1576533.6703	0.0238	0.1056	0.0028
42	0.0025	47.2797	2506793.9022	0.0189	0.0940	0.0020
43	0.0022	59.6187	3985969.8440	0.0150	0.0837	0.0014
44	0.0020	75.1780	6337958.4509	0.0119	0.0746	0.0010
45	0.0018	94.7978	10077777.5292	0.0094	0.0664	0.0007
46	0.0016	119.5380	16024339.8114	0.0075	0.0591	0.0005
47	0.0014	150.7348	25479771.2738	0.0059	0.0526	0.0003
48	0.0012	190.0734	40514539.2449	0.0047	0.0469	0.0002
49	0.0011	239.6784	64420825.1553	0.0037	0.0418	0.0002
50	0.0010	302.2294	102433417.5099	0.0030	0.0372	0.0001

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