

Resistance Wire for Low Temp Heating or Resistors Nickel-Copper Alloy - A180

$$i n^2 / \Omega = \frac{I^2 C_t}{p}$$

I = Current
 C_t = Temperature factor
 p = Surface load W/in²

Common Names: Alloy 180, CuNi 180, MWS-180, Cuprothal® 180, Midohm, HAI-180, Cu-Ni 23, Alloy 380, Nickel Alloy 180

Uses: Alloy exhibits low resistivity and high temperature coefficient of resistance. Typical applications include voltage regulators, timing devices, temperature sensitive resistors, temperature compensating devices, motor control, heating wires and cables, precision and vitreous resistors, potentiometers, and low temperature heating applications.

Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
22%	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	Balance	None/Trace	None/Trace	None/Trace	None/Trace

Technical Data

Resistivity (Ω/cm)	180	Resistivity (Ω/sqmf)	141
Resistivity (μΩ/cm)	29.93	Nom. Temp. Coeff. of Resistance (TCR)	0.00018
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu	-0.037	Specific Heat (20°C)	0.092 cal/g
Density (g/cm³)	8.89	Density (lb/in³)	0.321
Thermal Conductivity	0.035 W/cm/°C	Coeff. of Linear Expansion (X 10⁻⁶)	15.80 in/in/°C
Approx. Melting Point	1090°C	Max. Continuous Operating Temp.	400°C
UTS – Hard (KPSI)	100	YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)		YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	50	YTS Tensile – Annealed (KPSI)	
Magnetic Attraction	None	Emissivity – fully oxidized	
Designations/Specifications	ASTM = B267	Forms Available	Wire, Ribbon

Temperature Factor – To obtain resistance at working temperature multiply by the factor C_t , in the following table:

°C	100	200	300	400	500	600
A180 C_t	1.00	1.018	1.036	1.054	1.072	1.09

Alloy Data

Diameter mm	Resistance at 20° C Ω/m	Resistance at 20° C Ω/kg	Weight kg/1000 m	Surface area cm ² /m	cm ² /Ω at 20°C
10.4049	0.0035	0.0047	755.5052	326.8804	92884.2002
9.2658	0.0044	0.0074	599.1420	291.0952	65596.4463
8.2515	0.0056	0.0118	475.1405	259.2276	46325.3573
7.3481	0.0071	0.0187	376.8030	230.8486	32715.7773
6.5437	0.0089	0.0298	298.8180	205.5765	23104.4539
5.8273	0.0112	0.0473	236.9731	183.0710	16316.7693
5.1894	0.0141	0.0753	187.9279	163.0293	11523.1878
4.6213	0.0178	0.1197	149.0334	145.1817	8137.8767
4.1154	0.0225	0.1903	118.1887	129.2880	5747.1108
3.6648	0.0284	0.3027	93.7278	115.1342	4058.7101
3.2636	0.0358	0.4812	74.3294	102.5299	2866.3321
2.9063	0.0451	0.7652	58.9458	91.3054	2024.2538
2.5882	0.0569	1.2167	46.7461	81.3098	1429.5634
2.3048	0.0717	1.9347	37.0713	72.4084	1009.5827
2.0525	0.0904	3.0763	29.3988	64.4815	712.9850
1.8278	0.1140	4.8915	23.3143	57.4224	503.5224
1.7249	0.1281	6.1681	20.7620	54.1881	423.1439
1.6277	0.1438	7.7778	18.4890	51.1361	355.5964
1.5360	0.1615	9.8076	16.4650	48.2559	298.8316
1.4495	0.1813	12.3672	14.6625	45.5380	251.1284
1.3679	0.2036	15.5948	13.0573	42.9731	211.0401
1.2908	0.2287	19.6647	11.6278	40.5527	177.3512
1.2181	0.2568	24.7967	10.3549	38.2686	149.0402
1.1495	0.2883	31.2681	9.2213	36.1132	125.2485
1.0848	0.3238	39.4284	8.2118	34.0792	105.2548

Diameter mm	Resistance at 20° C Ω/m	Resistance at 20° C Ω/kg	Weight kg/1000 m	Surface area cm ² /m	cm ² /Ω at 20°C
1.0237	0.3636	49.7184	7.3128	32.1597	88.4527
0.9660	0.4083	62.6938	6.5122	30.3483	74.3328
0.9116	0.4585	79.0556	5.7993	28.6390	62.4669
0.8603	0.5148	99.6874	5.1644	27.0260	52.4951
0.8118	0.5781	125.7036	4.5991	25.5038	44.1152
0.7661	0.6492	158.5096	4.0956	24.0673	37.0730
0.7229	0.7290	199.8772	3.6472	22.7117	31.1549
0.6822	0.8186	252.0409	3.2479	21.4325	26.1816
0.6438	0.9192	317.8181	2.8924	20.2254	22.0021
0.6075	1.0323	400.7618	2.5757	19.0862	18.4899
0.5733	1.1591	505.3520	2.2937	18.0112	15.5383
0.5410	1.3016	637.2381	2.0426	16.9967	13.0579
0.5106	1.4617	803.5435	1.8190	16.0394	10.9734
0.4818	1.6413	1013.2511	1.6199	15.1360	9.2217
0.4547	1.8431	1277.6879	1.4425	14.2835	7.7496
0.4291	2.0697	1611.1370	1.2846	13.4790	6.5125
0.4049	2.3241	2031.6091	1.1440	12.7198	5.4729
0.3821	2.6099	2561.8155	1.0188	12.0034	4.5993
0.3606	2.9307	3230.3943	0.9072	11.3273	3.8651
0.3403	3.2910	4073.4578	0.8079	10.6893	3.2481
0.3211	3.6955	5136.5428	0.7195	10.0873	2.7296
0.2859	4.6600	8167.4464	0.5706	8.9830	1.9277
0.2546	5.8762	12986.7856	0.4525	7.9996	1.3614
0.2268	7.4097	20649.8571	0.3588	7.1238	0.9614
0.2019	9.3435	32834.6528	0.2846	6.3439	0.6790
0.1798	11.7819	52209.2925	0.2257	5.6494	0.4795
0.1601	14.8568	83016.2644	0.1790	5.0310	0.3386
0.1426	18.7340	132001.4087	0.1419	4.4802	0.2391
0.1270	23.6232	209891.0621	0.1125	3.9897	0.1689
0.1131	29.7884	333740.8166	0.0893	3.5529	0.1193
0.1007	37.5625	530670.2036	0.0708	3.1640	0.0842
0.0897	47.3655	843801.0907	0.0561	2.8176	0.0595
0.0799	59.7269	1341700.1289	0.0445	2.5092	0.0420
0.0711	75.3143	2133392.8764	0.0353	2.2345	0.0297
0.0633	94.9698	3392237.2571	0.0280	1.9898	0.0210
0.0564	119.7548	5393883.9561	0.0222	1.7720	0.0148
0.0502	151.0083	8576635.9861	0.0176	1.5780	0.0104
0.0447	190.4182	13637424.4303	0.0140	1.4053	0.0074
0.0398	240.1132	21684416.2902	0.0111	1.2514	0.0052
0.0355	302.7776	34479671.1616	0.0088	1.1144	0.0037
0.0316	381.7961	54824981.5674	0.0070	0.9924	0.0026
0.0281	481.4367	87175384.8747	0.0055	0.8838	0.0018
0.0251	607.0813	138614688.2461	0.0044	0.7870	0.0013

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