

## Resistance Wire for Low Temp Heating or Resistors Nickel-Copper Alloy - A90

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

I = Current  
C<sub>t</sub> = Temperature factor  
p = Surface load W/in<sup>2</sup>

**Common Names:** Alloy 90, CuNi 90, Alloy 290, #95 Alloy, 90 Alloy, MWS-90, Cu-Ni 10, Cuprothal 90, HAI-90, Cu-Ni 10, Alloy 260, Alloy 95, Nickel Alloy 90

**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
10%	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	90%	None/Trace	None/Trace	None/Trace	None/Trace

### Technical Data

Resistivity (Ω/cm <sup>2</sup> )	90	Resistivity (Ω/sqmf)	71
Resistivity (μΩ/cm)	14.96	Nom. Temp. Coeff. of Resistance (TCR)	0.00040
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu	-0.026	Specific Heat (20°C)	0.092 cal/g
Density (g/cm <sup>3</sup> )	8.89	Density (lb/in <sup>3</sup> )	0.321
Thermal Conductivity	0.60 W/cm/°C	Coeff. of Linear Expansion (X 10 <sup>-6</sup> )	16.00 in/in/°C
Approx. Melting Point	1100°C	Max. Continuous Operating Temp.	400°C
UTS – Hard (KPSI)	75	YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)		YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	35	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<sub>t</sub>, in the following table:

°C	100	200	300	400	500
A90 C <sub>t</sub>	1.00	1.035	1.07	1.11	1.15

### Alloy Data

Diameter mm	Resistance at 20° C Ω/m	Resistance at 20° C Ω/kg	Weight kg/1000 m	Surface area cm <sup>2</sup> /m	cm <sup>2</sup> /Ω at 20°C
10.4049	0.0018	0.0023	755.5052	326.8804	185768.4005
9.2658	0.0022	0.0037	599.1420	291.0952	131192.8925
8.2515	0.0028	0.0059	475.1405	259.2276	92650.7145
7.3481	0.0035	0.0094	376.8030	230.8486	65431.5546
6.5437	0.0044	0.0149	298.8180	205.5765	46208.9079
5.8273	0.0056	0.0237	236.9731	183.0710	32633.5387
5.1894	0.0071	0.0376	187.9279	163.0293	23046.3756
4.6213	0.0089	0.0599	149.0334	145.1817	16275.7534
4.1154	0.0112	0.0952	118.1887	129.2880	11494.2216
3.6648	0.0142	0.1513	93.7278	115.1342	8117.4203
3.2636	0.0179	0.2406	74.3294	102.5299	5732.6641
2.9063	0.0226	0.3826	58.9458	91.3054	4048.5076
2.5882	0.0284	0.6084	46.7461	81.3098	2859.1269
2.3048	0.0359	0.9673	37.0713	72.4084	2019.1654
2.0525	0.0452	1.5381	29.3988	64.4815	1425.9699
1.8278	0.0570	2.4457	23.3143	57.4224	1007.0449
1.7249	0.0640	3.0840	20.7620	54.1881	846.2878
1.6277	0.0719	3.8889	18.4890	51.1361	711.1927
1.5360	0.0807	4.9038	16.4650	48.2559	597.6632
1.4495	0.0907	6.1836	14.6625	45.5380	502.2567

Diameter mm	Resistance at 20° C Ω/m	Resistance at 20° C Ω/kg	Weight kg/1000 m	Surface area cm <sup>2</sup> /m	cm <sup>2</sup> /Ω at 20°C
1.3679	0.1018	7.7974	13.0573	42.9731	422.0802
1.2908	0.1143	9.8323	11.6278	40.5527	354.7025
1.2181	0.1284	12.3984	10.3549	38.2686	298.0804
1.1495	0.1442	15.6341	9.2213	36.1132	250.4971
1.0848	0.1619	19.7142	8.2118	34.0792	210.5096
1.0237	0.1818	24.8592	7.3128	32.1597	176.9054
0.9660	0.2041	31.3469	6.5122	30.3483	148.6656
0.9116	0.2292	39.5278	5.7993	28.6390	124.9337
0.8603	0.2574	49.8437	5.1644	27.0260	104.9902
0.8118	0.2891	62.8518	4.5991	25.5038	88.2304
0.7661	0.3246	79.2548	4.0956	24.0673	74.1459
0.7229	0.3645	99.9386	3.6472	22.7117	62.3098
0.6822	0.4093	126.0204	3.2479	21.4325	52.3632
0.6438	0.4596	158.9091	2.8924	20.2254	44.0043
0.6075	0.5161	200.3809	2.5757	19.0862	36.9798
0.5733	0.5796	252.6760	2.2937	18.0112	31.0766
0.5410	0.6508	318.6190	2.0426	16.9967	26.1158
0.5106	0.7308	401.7718	1.8190	16.0394	21.9468
0.4818	0.8207	506.6256	1.6199	15.1360	18.4434
0.4547	0.9216	638.8439	1.4425	14.2835	15.4992
0.4291	1.0349	805.5685	1.2846	13.4790	13.0251
0.4049	1.1621	1015.8046	1.1440	12.7198	10.9458
0.3821	1.3049	1280.9077	1.0188	12.0034	9.1985
0.3606	1.4653	1615.1971	0.9072	11.3273	7.7301
0.3403	1.6455	2036.7289	0.8079	10.6893	6.4962
0.3211	1.8478	2568.2714	0.7195	10.0873	5.4592
0.2859	2.3300	4083.7232	0.5706	8.9830	3.8554
0.2546	2.9381	6493.3928	0.4525	7.9996	2.7227
0.2268	3.7049	10324.9285	0.3588	7.1238	1.9228
0.2019	4.6717	16417.3264	0.2846	6.3439	1.3579
0.1798	5.8910	26104.6462	0.2257	5.6494	0.9590
0.1601	7.4284	41508.1322	0.1790	5.0310	0.6773
0.1426	9.3670	66000.7044	0.1419	4.4802	0.4783
0.1270	11.8116	104945.5310	0.1125	3.9897	0.3378
0.1131	14.8942	166870.4083	0.0893	3.5529	0.2385
0.1007	18.7813	265335.1018	0.0708	3.1640	0.1685
0.0897	23.6828	421900.5453	0.0561	2.8176	0.1190
0.0799	29.8634	670850.0645	0.0445	2.5092	0.0840
0.0711	37.6572	1066696.4382	0.0353	2.2345	0.0593
0.0633	47.4849	1696118.6285	0.0280	1.9898	0.0419
0.0564	59.8774	2696941.9781	0.0222	1.7720	0.0296
0.0502	75.5041	4288317.9930	0.0176	1.5780	0.0209
0.0447	95.2091	6818712.2151	0.0140	1.4053	0.0148
0.0398	120.0566	10842208.1451	0.0111	1.2514	0.0104
0.0355	151.3888	17239835.5808	0.0088	1.1144	0.0074
0.0316	190.8980	27412490.7837	0.0070	0.9924	0.0052
0.0281	240.7183	43587692.4374	0.0055	0.8838	0.0037
0.0251	303.5407	69307344.1230	0.0044	0.7870	0.0026

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