

## Resistance Wire for Low Temp Heating or Resistors Nickel Alloy - A120

$$I = \text{Current}$$

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

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

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

**Common Names:** Alloy 120, MWS-120, Balco®, Hytemco®, HAI-380, Pelcoloy, Nickel Alloy 120, NIFE 5200, Alloy K70, Nifethal® 70

**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
70%	None/Trace	30%	None/Trace							

### Technical Data

<b>Resistivity (Ω/cm)</b>	120	<b>Resistivity (Ω/sqmf)</b>	94
<b>Resistivity (μΩ/cm)</b>	19.95	<b>Nom. Temp. Coeff. of Resistance (TCR)</b>	0.0045
<b>Std. Res. Tol. &lt;.020"</b>	5%	<b>Std. Res. Tol. &gt;.020"</b>	3%
<b>Thermal EMF vs. Cu</b>	-0.04	<b>Specific Heat (20°C)</b>	0.125 cal/g
<b>Density (g/cm<sup>3</sup>)</b>	8.44	<b>Density (lb/in<sup>3</sup>)</b>	0.305
<b>Thermal Conductivity</b>	0.16 W/cm/°C	<b>Coeff. of Linear Expansion (X 10<sup>-6</sup>)</b>	15.00 in/in/°C
<b>Approx. Melting Point</b>	1430°C	<b>Max. Continuous Operating Temp.</b>	600°C
<b>UTS – Hard (KPSI)</b>	150	<b>YTS Tensile – Hard (KPSI)</b>	
<b>UTS – Stress Relieved (KPSI)</b>	120	<b>YTS Tensile – Stress Relieved (KPSI)</b>	
<b>UTS – Annealed (KPSI)</b>	70	<b>YTS Tensile – Annealed (KPSI)</b>	
<b>Magnetic Attraction</b>	Strong	<b>Emissivity – fully oxidized</b>	
<b>Designations/Specifications</b>	ASTM = B267	<b>Forms Available</b>	Wire, Ribbon

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

°F	68	212	392	572	752	932
<b>A120 <math>C_t</math></b>	1.00	1.35	1.80	2.30	2.82	3.40

### Alloy Data

Gage AWG	Diameter Inch	Resistance at 68° F Ω/ft	Resistance at 68° F Ω/lb	Weight lb/1000 ft	Surface area in <sup>2</sup> /ft	in <sup>2</sup> /Ω at 68°F
000	0.4096	0.0007	0.0015	482.3713	15.4432	21595.6197
00	0.3648	0.0009	0.0024	382.5373	13.7525	15251.2043
0	0.3249	0.0011	0.0037	303.3655	12.2470	10770.6671
1	0.2893	0.0014	0.0060	240.5794	10.9062	7606.4334
2	0.2576	0.0018	0.0095	190.7879	9.7123	5371.7963
3	0.2294	0.0023	0.0151	151.3014	8.6490	3793.6565
4	0.2043	0.0029	0.0240	119.9873	7.7022	2679.1465
5	0.1819	0.0036	0.0381	95.1541	6.8590	1892.0601
6	0.1620	0.0046	0.0606	75.4606	6.1081	1336.2059
7	0.1443	0.0058	0.0963	59.8429	5.4394	943.6520
8	0.1285	0.0073	0.1532	47.4575	4.8439	666.4235
9	0.1144	0.0092	0.2435	37.6354	4.3136	470.6400
10	0.1019	0.0116	0.3872	29.8462	3.8414	332.3742
11	0.0907	0.0146	0.6157	23.6691	3.4209	234.7284
12	0.0808	0.0184	0.9790	18.7704	3.0464	165.7693
13	0.0720	0.0232	1.5568	14.8856	2.7129	117.0692
13.5	0.0679	0.0260	1.9630	13.2560	2.5601	98.3811
14	0.0641	0.0292	2.4753	11.8048	2.4159	82.6763
14.5	0.0605	0.0328	3.1214	10.5125	2.2798	69.4785
15	0.0571	0.0368	3.9360	9.3616	2.1514	58.3875
15.5	0.0539	0.0414	4.9632	8.3368	2.0302	49.0669
16	0.0508	0.0465	6.2584	7.4241	1.9159	41.2342
16.5	0.0480	0.0522	7.8918	6.6113	1.8080	34.6519
17	0.0453	0.0586	9.9513	5.8876	1.7061	29.1203
17.5	0.0427	0.0658	12.5484	5.2430	1.6100	24.4718

Gage AWG	Diameter Inch	Resistance at 68° F Ω/ft	Resistance at 68° F Ω/lb	Weight Lb/1000 ft	Surface area in <sup>2</sup> /ft	in <sup>2</sup> /Ω at 68°F
18	0.0403	0.0739	15.8233	4.6690	1.5194	20.5653
18.5	0.0380	0.0830	19.9528	4.1579	1.4338	17.2824
19	0.0359	0.0932	25.1601	3.7027	1.3530	14.5236
19.5	0.0339	0.1046	31.7263	3.2974	1.2768	12.2051
20	0.0320	0.1175	40.0062	2.9364	1.2049	10.2568
20.5	0.0302	0.1319	50.4470	2.6149	1.1370	8.6195
21	0.0285	0.1481	63.6126	2.3287	1.0730	7.2435
21.5	0.0269	0.1663	80.2141	2.0737	1.0126	6.0872
22	0.0253	0.1868	101.1482	1.8467	0.9555	5.1155
22.5	0.0239	0.2098	127.5458	1.6445	0.9017	4.2989
23	0.0226	0.2355	160.8325	1.4645	0.8509	3.6127
23.5	0.0213	0.2645	202.8063	1.3042	0.8030	3.0360
24	0.0201	0.2970	255.7344	1.1614	0.7578	2.5513
24.5	0.0190	0.3335	322.4755	1.0343	0.7151	2.1441
25	0.0179	0.3745	406.6347	0.9210	0.6748	1.8018
25.5	0.0169	0.4206	512.7576	0.8202	0.6368	1.5142
26	0.0159	0.4723	646.5764	0.7304	0.6009	1.2725
26.5	0.0150	0.5303	815.3189	0.6504	0.5671	1.0693
27	0.0142	0.5955	1028.0996	0.5792	0.5351	0.8986
27.5	0.0134	0.6687	1296.4116	0.5158	0.5050	0.7552
28	0.0126	0.7509	1634.7471	0.4594	0.4766	0.6346
29	0.0113	0.9469	2599.3572	0.3643	0.4244	0.4482
30	0.0100	1.1940	4133.1517	0.2889	0.3779	0.3165
31	0.0089	1.5057	6571.9874	0.2291	0.3366	0.2235
32	0.0080	1.8986	10449.8992	0.1817	0.2997	0.1579
33	0.0071	2.3941	16616.0382	0.1441	0.2669	0.1115
34	0.0063	3.0189	26420.6113	0.1143	0.2377	0.0787
35	0.0056	3.8068	42010.5377	0.0906	0.2117	0.0556
36	0.0050	4.8002	66799.5627	0.0719	0.1885	0.0393
37	0.0045	6.0530	106215.7693	0.0570	0.1679	0.0277
38	0.0040	7.6327	168890.1720	0.0452	0.1495	0.0196
39	0.0035	9.6247	268546.6610	0.0358	0.1331	0.0138
40	0.0031	12.1365	427007.1392	0.0284	0.1185	0.0098
41	0.0028	15.3039	678969.8899	0.0225	0.1056	0.0069
42	0.0025	19.2979	1079607.5034	0.0179	0.0940	0.0049
43	0.0022	24.3342	1716648.0850	0.0142	0.0837	0.0034
44	0.0020	30.6849	2729585.1860	0.0112	0.0746	0.0024
45	0.0018	38.6930	4340222.8753	0.0089	0.0664	0.0017
46	0.0016	48.7910	6901244.4469	0.0071	0.0591	0.0012
47	0.0014	61.5244	10973439.9096	0.0056	0.0526	0.0009
48	0.0012	77.5810	17448502.8571	0.0044	0.0469	0.0006
49	0.0011	97.8279	27744285.6992	0.0035	0.0418	0.0004
50	0.0010	123.3589	44115268.5283	0.0028	0.0372	0.0003

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