

## Resistance Heating Wire Nickel-Chromium Alloy 70% Nickel / 20% Chromium - HAA

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

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

**Common Names:** Chromel AA

**Uses:** Used for very corrosion resistant electric heating elements and mechanical purpose parts in industrial furnaces with reducing atmospheres. Supremely resistant to "green rot" - a preferential intergranular oxidation of the chromium that is commonly experienced with other alloys under certain environmental conditions such as reducing atmospheres. Extremely resistant to oxidation in air.

### Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
68%	20%	8.3%	None/Trace	2.0%	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace

### Technical Data

Resistivity (Ω/cm <sup>f</sup> )	700	Resistivity (Ω/sqmf)	550
Resistivity (μΩ/cm)	116.31	Nom. Temp. Coeff. of Resistance (TCR)	0.000085
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu		Specific Heat (20°C)	
Density (g/cm <sup>3</sup> )	8.20	Density (lb/in <sup>3</sup> )	0.301
Thermal Conductivity		Coeff. of Linear Expansion (X 10 <sup>-6</sup> )	
Approx. Melting Point	1380°C	Max. Continuous Operating Temp.	1150°C
UTS – Hard (KPSI)	200	YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)	175	YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	120	YTS Tensile – Annealed (KPSI)	
Magnetic Attraction	None	Emissivity – fully oxidized	0.88
Designations/Specifications	UNS = N06008	Forms Available	Wire, Ribbon, Square

**Temperature Factor** – To obtain resistance at working temperature multiply by the factor C<sub>t</sub>, in the following table:

°F	68	212	392	572	752	932	1112	1292	1472	1652	1832	2012
HAA C <sub>t</sub>	1.00	1.01	1.023	1.043	1.063	1.064	1.056	1.05	1.052	1.057	1.063	1.07

### 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	0.0042	0.0088	476.0452	15.4432	3702.1062
00	0.3648	0.0053	0.0139	377.5204	13.7525	2614.4922
0	0.3249	0.0066	0.0222	299.3869	12.2470	1846.4001
1	0.2893	0.0084	0.0352	237.4243	10.9062	1303.9600
2	0.2576	0.0105	0.0560	188.2857	9.7123	920.8794
3	0.2294	0.0133	0.0891	149.3172	8.6490	650.3411
4	0.2043	0.0168	0.1416	118.4137	7.7022	459.2823
5	0.1819	0.0211	0.2252	93.9062	6.8590	324.3532
6	0.1620	0.0267	0.3581	74.4709	6.1081	229.0639
7	0.1443	0.0336	0.5693	59.0580	5.4394	161.7689
8	0.1285	0.0424	0.9053	46.8351	4.8439	114.2440
9	0.1144	0.0535	1.4395	37.1419	4.3136	80.6811
10	0.1019	0.0674	2.2889	29.4548	3.8414	56.9784
11	0.0907	0.0850	3.6395	23.3587	3.4209	40.2392
12	0.0808	0.1072	5.7870	18.5242	3.0464	28.4176
13	0.0720	0.1352	9.2017	14.6904	2.7129	20.0690
13.5	0.0679	0.1518	11.6032	13.0821	2.5601	16.8653
14	0.0641	0.1705	14.6314	11.6500	2.4159	14.1731
14.5	0.0605	0.1914	18.4499	10.3746	2.2798	11.9106
15	0.0571	0.2149	23.2649	9.2388	2.1514	10.0093

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
15.5	0.0539	0.2414	29.3365	8.2274	2.0302	8.4115
16	0.0508	0.2710	36.9927	7.3267	1.9159	7.0687
16.5	0.0480	0.3044	46.6470	6.5246	1.8080	5.9403
17	0.0453	0.3418	58.8209	5.8103	1.7061	4.9921
17.5	0.0427	0.3838	74.1719	5.1743	1.6100	4.1952
18	0.0403	0.4310	93.5291	4.6078	1.5194	3.5255
18.5	0.0380	0.4839	117.9382	4.1034	1.4338	2.9627
19	0.0359	0.5434	148.7176	3.6542	1.3530	2.4898
19.5	0.0339	0.6102	187.5297	3.2541	1.2768	2.0923
20	0.0320	0.6853	236.4709	2.8979	1.2049	1.7583
20.5	0.0302	0.7695	298.1847	2.5806	1.1370	1.4776
21	0.0285	0.8641	376.0045	2.2981	1.0730	1.2417
21.5	0.0269	0.9703	474.1336	2.0465	1.0126	1.0435
22	0.0253	1.0896	597.8723	1.8225	0.9555	0.8769
22.5	0.0239	1.2236	753.9042	1.6230	0.9017	0.7370
23	0.0226	1.3740	950.6570	1.4453	0.8509	0.6193
23.5	0.0213	1.5429	1198.7580	1.2871	0.8030	0.5205
24	0.0201	1.7326	1511.6081	1.1462	0.7578	0.4374
24.5	0.0190	1.9455	1906.1053	1.0207	0.7151	0.3676
25	0.0179	2.1847	2403.5579	0.9090	0.6748	0.3089
25.5	0.0169	2.4533	3030.8349	0.8094	0.6368	0.2596
26	0.0159	2.7549	3821.8177	0.7208	0.6009	0.2181
26.5	0.0150	3.0935	4819.2300	0.6419	0.5671	0.1833
27	0.0142	3.4738	6076.9456	0.5716	0.5351	0.1541
27.5	0.0134	3.9009	7662.8978	0.5091	0.5050	0.1295
28	0.0126	4.3804	9662.7496	0.4533	0.4766	0.1088
29	0.0113	5.5236	15364.4176	0.3595	0.4244	0.0768
30	0.0100	6.9652	24430.4509	0.2851	0.3779	0.0543
31	0.0089	8.7830	38846.0497	0.2261	0.3366	0.0383
32	0.0080	11.0751	61767.8153	0.1793	0.2997	0.0271
33	0.0071	13.9655	98214.9546	0.1422	0.2669	0.0191
34	0.0063	17.6102	156168.3419	0.1128	0.2377	0.0135
35	0.0056	22.2061	248318.1010	0.0894	0.2117	0.0095
36	0.0050	28.0014	394842.3767	0.0709	0.1885	0.0067
37	0.0045	35.3092	627825.7679	0.0562	0.1679	0.0048
38	0.0040	44.5241	998284.9311	0.0446	0.1495	0.0034
39	0.0035	56.1439	1587339.7600	0.0354	0.1331	0.0024
40	0.0031	70.7963	2523976.3070	0.0280	0.1185	0.0017
41	0.0028	89.2726	4013291.0160	0.0222	0.1056	0.0012
42	0.0025	112.5708	6381400.9405	0.0176	0.0940	0.0008
43	0.0022	141.9494	10146853.9910	0.0140	0.0837	0.0006
44	0.0020	178.9951	16134176.0024	0.0111	0.0746	0.0004
45	0.0018	225.7090	25654418.1581	0.0088	0.0664	0.0003
46	0.0016	284.6142	40792239.4634	0.0070	0.0591	0.0002
47	0.0014	358.8924	64862387.0626	0.0055	0.0526	0.0001
48	0.0012	452.5556	103135530.4540	0.0044	0.0469	0.0001
49	0.0011	570.6629	163992386.4003	0.0035	0.0418	0.0001
50	0.0010	719.5937	260758854.6728	0.0028	0.0372	0.0001

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