

Resistance Heating Wire Iron-Chrome-Aluminum (Fe-Cr-Al) Alloy - KA

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

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

Common Names: Alloy 835, Kanthal® A

Uses: Typical applications include elements embedded in ceramics for panel heaters, infrared heaters, warming plates, irons, ceramic pots, in cartridge heaters for liquid heating, storage heaters, in ceramic heaters for cooking plates, air guns, hobby kilns, radiators, in quartz tube heaters for space heating, toasters, toaster ovens, grills, industrial infrared dryers, coils on molded ceramic fiber for cooking plates with ceramic hobs. In addition to industrial furnaces, this alloy is used in appliances where its high resistivity and good oxidation resistance are of particular importance.

Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
None/Trace	22%	Balance	5.3%	None/Trace						

Technical Data

Resistivity (Ω/cm ²)	836	Resistivity (Ω/sqmf)	656
Resistivity (μΩ/cm)	139	Nom. Temp. Coeff. of Resistance (TCR)	0.00002
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu		Specific Heat (20°C)	0.1099 cal/g
Density (g/cm ³)	7.15	Density (lb/in ³)	0.258
Thermal Conductivity	0.11 W/cm ² /°C	Coeff. of Linear Expansion (X 10 ⁻⁶)	11.00 in/in/°C
Approx. Melting Point	1500°C	Max. Continuous Operating Temp.	1300°C
UTS – Hard (KPSI)	105	YTS Tensile – Hard (KPSI)	80
UTS – Stress Relieved (KPSI)		YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)		YTS Tensile – Annealed (KPSI)	
Magnetic Attraction	Strong	Emissivity – fully oxidized	0.70
Designations/Specifications	ASTM = B603	Forms Available	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	1112	1292	1472	1652	1832	2012	2192	2372
KA C_t	1.00	1.00	1.01	1.01	1.02	1.03	1.04	1.04	1.05	1.05	1.06	1.06	1.06	1.06

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 ² /ft	in ² /Ω at 68°F
000	0.4096	0.0050	0.0122	408.0387	15.4432	3099.8497
00	0.3648	0.0063	0.0194	323.5889	13.7525	2189.1681
0	0.3249	0.0079	0.0309	256.6173	12.2470	1546.0288
1	0.2893	0.0100	0.0491	203.5065	10.9062	1091.8326
2	0.2576	0.0126	0.0780	161.3878	9.7123	771.0712
3	0.2294	0.0159	0.1241	127.9861	8.6490	544.5440
4	0.2043	0.0200	0.1973	101.4975	7.7022	384.5665
5	0.1819	0.0253	0.3138	80.4910	6.8590	271.5876
6	0.1620	0.0318	0.4989	63.8322	6.1081	191.7999
7	0.1443	0.0402	0.7933	50.6212	5.4394	135.4524
8	0.1285	0.0506	1.2614	40.1444	4.8439	95.6589
9	0.1144	0.0639	2.0057	31.8359	4.3136	67.5560
10	0.1019	0.0805	3.1892	25.2470	3.8414	47.7092
11	0.0907	0.1015	5.0710	20.0217	3.4209	33.6931
12	0.0808	0.1280	8.0632	15.8779	3.0464	23.7946
13	0.0720	0.1614	12.8211	12.5917	2.7129	16.8042
13.5	0.0679	0.1813	16.1671	11.2133	2.5601	14.1217
14	0.0641	0.2036	20.3864	9.9857	2.4159	11.8674
14.5	0.0605	0.2286	25.7068	8.8925	2.2798	9.9730
15	0.0571	0.2567	32.4157	7.9190	2.1514	8.3810
15.5	0.0539	0.2883	40.8755	7.0521	2.0302	7.0431
16	0.0508	0.3237	51.5432	6.2800	1.9159	5.9188
16.5	0.0480	0.3635	64.9948	5.5925	1.8080	4.9740
17	0.0453	0.4082	81.9571	4.9803	1.7061	4.1800
17.5	0.0427	0.4583	103.3461	4.4351	1.6100	3.5127

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
18	0.0403	0.5147	130.3173	3.9495	1.5194	2.9520
18.5	0.0380	0.5780	164.3273	3.5172	1.4338	2.4807
19	0.0359	0.6490	207.2132	3.1321	1.3530	2.0847
19.5	0.0339	0.7288	261.2913	2.7892	1.2768	1.7519
20	0.0320	0.8184	329.4828	2.4839	1.2049	1.4723
20.5	0.0302	0.9190	415.4707	2.2120	1.1370	1.2372
21	0.0285	1.0320	523.8996	1.9698	1.0730	1.0397
21.5	0.0269	1.1588	660.6262	1.7542	1.0126	0.8738
22	0.0253	1.3013	833.0354	1.5621	0.9555	0.7343
22.5	0.0239	1.4613	1050.4398	1.3911	0.9017	0.6171
23	0.0226	1.6409	1324.5820	1.2388	0.8509	0.5186
23.5	0.0213	1.8426	1670.2695	1.1032	0.8030	0.4358
24	0.0201	2.0692	2106.1739	0.9824	0.7578	0.3662
24.5	0.0190	2.3235	2655.8401	0.8749	0.7151	0.3078
25	0.0179	2.6092	3348.9573	0.7791	0.6748	0.2586
25.5	0.0169	2.9299	4222.9633	0.6938	0.6368	0.2173
26	0.0159	3.2901	5325.0660	0.6179	0.6009	0.1826
26.5	0.0150	3.6946	6714.7938	0.5502	0.5671	0.1535
27	0.0142	4.1488	8467.2108	0.4900	0.5351	0.1290
27.5	0.0134	4.6588	10676.9710	0.4363	0.5050	0.1084
28	0.0126	5.2315	13463.4311	0.3886	0.4766	0.0911
29	0.0113	6.5968	21407.7552	0.3082	0.4244	0.0643
30	0.0100	8.3184	34039.7616	0.2444	0.3779	0.0454
31	0.0089	10.4894	54125.4960	0.1938	0.3366	0.0321
32	0.0080	13.2269	86063.1560	0.1537	0.2997	0.0227
33	0.0071	16.6788	136846.1700	0.1219	0.2669	0.0160
34	0.0063	21.0316	217594.5563	0.0967	0.2377	0.0113
35	0.0056	26.5204	345989.8873	0.0767	0.2117	0.0080
36	0.0050	33.4417	550147.0448	0.0608	0.1885	0.0056
37	0.0045	42.1692	874770.5699	0.0482	0.1679	0.0040
38	0.0040	53.1745	1390943.6707	0.0382	0.1495	0.0028
39	0.0035	67.0519	2211693.3990	0.0303	0.1331	0.0020
40	0.0031	84.5510	3516740.3211	0.0240	0.1185	0.0014
41	0.0028	106.6170	5591852.1490	0.0191	0.1056	0.0010
42	0.0025	134.4417	8891418.6437	0.0151	0.0940	0.0007
43	0.0022	169.5281	14137949.8941	0.0120	0.0837	0.0005
44	0.0020	213.7713	22480285.2299	0.0095	0.0746	0.0003
45	0.0018	269.5611	35745155.9670	0.0075	0.0664	0.0002
46	0.0016	339.9107	56837186.9857	0.0060	0.0591	0.0002
47	0.0014	428.6201	90374925.9739	0.0047	0.0526	0.0001
48	0.0012	540.4807	143702172.4325	0.0038	0.0469	0.0001
49	0.0011	681.5346	228496058.3843	0.0030	0.0418	0.0001
50	0.0010	859.4005	363324004.1775	0.0024	0.0372	0.0000

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