

# Resistance Wire for Low Temp Heating or Resistors

## Nickel-Iron Alloy - A52

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

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

**Common Names:** Alloy 52, Kanthal® 52

**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
52%	None/Trace	Balance	None/Trace							

### Technical Data

Resistivity (Ω/cm <sup>2</sup> )	220	Resistivity (Ω/sqmf)	204
Resistivity (μΩ/cm)	43	Nom. Temp. Coeff. of Resistance (TCR)	0.00290
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu		Specific Heat (20°C)	0.1194 cal/g
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> )	4.90 in/in/°C
Approx. Melting Point	1435°C	Max. Continuous Operating Temp.	600°C
UTS – Hard (KPSI)	150	YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)		YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	70	YTS Tensile – Annealed (KPSI)	
Magnetic Attraction	Strong	Emissivity – fully oxidized	
Designations/Specifications	ASTM = F30	Forms Available	Wire, Ribbon.

**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
A52 C <sub>t</sub>	1.00	1.33	1.73	2.13	2.49	2.77

### 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	0.0015	0.0033	476.0452	15.4432	9967.2091
00	0.3648	0.0020	0.0052	377.5204	13.7525	7039.0173
0	0.3249	0.0025	0.0082	299.3869	12.2470	4971.0771
1	0.2893	0.0031	0.0131	237.4243	10.9062	3510.6616
2	0.2576	0.0039	0.0208	188.2857	9.7123	2479.2906
3	0.2294	0.0049	0.0331	149.3172	8.6490	1750.9184
4	0.2043	0.0062	0.0526	118.4137	7.7022	1236.5292
5	0.1819	0.0079	0.0836	93.9062	6.8590	873.2585
6	0.1620	0.0099	0.1330	74.4709	6.1081	616.7104
7	0.1443	0.0125	0.2115	59.0580	5.4394	435.5317
8	0.1285	0.0157	0.3363	46.8351	4.8439	307.5801
9	0.1144	0.0199	0.5347	37.1419	4.3136	217.2184
10	0.1019	0.0250	0.8502	29.4548	3.8414	153.4035
11	0.0907	0.0316	1.3518	23.3587	3.4209	108.3362
12	0.0808	0.0398	2.1495	18.5242	3.0464	76.5089
13	0.0720	0.0502	3.4178	14.6904	2.7129	54.0319
13.5	0.0679	0.0564	4.3098	13.0821	2.5601	45.4067
14	0.0641	0.0633	5.4345	11.6500	2.4159	38.1583
14.5	0.0605	0.0711	6.8528	10.3746	2.2798	32.0670
15	0.0571	0.0798	8.6412	9.2388	2.1514	26.9481
15.5	0.0539	0.0896	10.8964	8.2274	2.0302	22.6463
16	0.0508	0.1007	13.7402	7.3267	1.9159	19.0312
16.5	0.0480	0.1130	17.3260	6.5246	1.8080	15.9932
17	0.0453	0.1269	21.8478	5.8103	1.7061	13.4402
17.5	0.0427	0.1425	27.5496	5.1743	1.6100	11.2947
18	0.0403	0.1601	34.7394	4.6078	1.5194	9.4917

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
18.5	0.0380	0.1798	43.8056	4.1034	1.4338	7.9765
19	0.0359	0.2018	55.2380	3.6542	1.3530	6.7032
19.5	0.0339	0.2267	69.6539	3.2541	1.2768	5.6331
20	0.0320	0.2545	87.8320	2.8979	1.2049	4.7339
20.5	0.0302	0.2858	110.7543	2.5806	1.1370	3.9782
21	0.0285	0.3210	139.6588	2.2981	1.0730	3.3432
21.5	0.0269	0.3604	176.1068	2.0465	1.0126	2.8095
22	0.0253	0.4047	222.0669	1.8225	0.9555	2.3610
22.5	0.0239	0.4545	280.0215	1.6230	0.9017	1.9841
23	0.0226	0.5103	353.1012	1.4453	0.8509	1.6674
23.5	0.0213	0.5731	445.2530	1.2871	0.8030	1.4012
24	0.0201	0.6435	561.4544	1.1462	0.7578	1.1775
24.5	0.0190	0.7226	707.9820	1.0207	0.7151	0.9896
25	0.0179	0.8115	892.7501	0.9090	0.6748	0.8316
25.5	0.0169	0.9112	1125.7387	0.8094	0.6368	0.6988
26	0.0159	1.0232	1419.5323	0.7208	0.6009	0.5873
26.5	0.0150	1.1490	1789.9997	0.6419	0.5671	0.4935
27	0.0142	1.2903	2257.1512	0.5716	0.5351	0.4148
27.5	0.0134	1.4489	2846.2192	0.5091	0.5050	0.3485
28	0.0126	1.6270	3589.0213	0.4533	0.4766	0.2929
29	0.0113	2.0516	5706.7837	0.3595	0.4244	0.2069
30	0.0100	2.5871	9074.1675	0.2851	0.3779	0.1461
31	0.0089	3.2622	14428.5328	0.2261	0.3366	0.1032
32	0.0080	4.1136	22942.3314	0.1793	0.2997	0.0729
33	0.0071	5.1872	36479.8403	0.1422	0.2669	0.0515
34	0.0063	6.5409	58005.3841	0.1128	0.2377	0.0363
35	0.0056	8.2480	92232.4375	0.0894	0.2117	0.0257
36	0.0050	10.4005	146655.7399	0.0709	0.1885	0.0181
37	0.0045	13.1148	233192.4281	0.0562	0.1679	0.0128
38	0.0040	16.5375	370791.5458	0.0446	0.1495	0.0090
39	0.0035	20.8535	589583.3394	0.0354	0.1331	0.0064
40	0.0031	26.2958	937476.9140	0.0280	0.1185	0.0045
41	0.0028	33.1584	1490650.9488	0.0222	0.1056	0.0032
42	0.0025	41.8120	2370234.6350	0.0176	0.0940	0.0022
43	0.0022	52.7241	3768831.4824	0.0140	0.0837	0.0016
44	0.0020	66.4839	5992693.9437	0.0111	0.0746	0.0011
45	0.0018	83.8348	9528783.8873	0.0088	0.0664	0.0008
46	0.0016	105.7139	15151403.2293	0.0070	0.0591	0.0006
47	0.0014	133.3029	24091743.7661	0.0055	0.0526	0.0004
48	0.0012	168.0921	38307482.7400	0.0044	0.0469	0.0003
49	0.0011	211.9605	60911457.8058	0.0035	0.0418	0.0002
50	0.0010	267.2777	96853288.8785	0.0028	0.0372	0.0001

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