

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

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

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

Common Names: KAPM, Alloy 875 PM, Kanthal APM

Uses: Typical applications are in furnaces for firing of high temperature ceramics, heat treatment furnaces, laboratory furnaces, diffusion furnaces, and high temperature kilns. Produced from powder metallurgy technology this alloy has demonstrated significant improvements in both physical and mechanical properties. Its advantages are better form stability, high temperature strength, and the ability to be self-supporting at temperatures above 1300° C. It has an excellent surface oxide, which gives good protection in corrosive atmospheres as well as in atmospheres with high carbon potential, and no scaling.

Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
None/Trace	22%	Balance	5.8%	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace

Technical Data

Resistivity (Ω/cmft)	872	Resistivity (Ω/sqmf)	684
Resistivity (μΩ/cm)	145	Nom. Temp. Coeff. of Resistance (TCR)	0.00002
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu	-6.4	Specific Heat (20°C)	0.11 cal/g
Density (g/cm³)	7.10	Density (lb/in³)	0.256
Thermal Conductivity	0.11 W/cm/°C	Coeff. of Linear Expansion (X 10⁻⁶)	15.00 in/in/°C
Approx. Melting Point	1500°C	Max. Continuous Operating Temp.	1400°C
UTS – Hard (KPSI)	200	YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)	175	YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	115	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:

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
KAPM C_t	1.00	1.00	1.00	1.00	1.00	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.04	1.04	1.05

Alloy Data

Diameter mm	Resistance at 20° C Ω/m	Resistance at 20° C Ω/kg	Weight kg/1000 m	Surface area cm ² /m	cm ² /Ω at 20°C
10.4049	0.0170	0.0283	602.5213	326.8804	19173.3441
9.2658	0.0215	0.0450	477.8204	291.0952	13540.5508
8.2515	0.0271	0.0715	378.9283	259.2276	9562.5737
7.3481	0.0342	0.1138	300.5034	230.8486	6753.2568
6.5437	0.0431	0.1809	238.3097	205.5765	4769.2680
5.8273	0.0544	0.2876	188.9879	183.0710	3368.1405
5.1894	0.0685	0.4573	149.8740	163.0293	2378.6397
4.6213	0.0864	0.7272	118.8553	145.1817	1679.8369
4.1154	0.1090	1.1562	94.2564	129.2880	1186.3302
3.6648	0.1374	1.8385	74.7486	115.1342	837.8071
3.2636	0.1733	2.9233	59.2783	102.5299	591.6741
2.9063	0.2185	4.6482	47.0097	91.3054	417.8506
2.5882	0.2755	7.3910	37.2804	81.3098	295.0934
2.3048	0.3474	11.7522	29.5646	72.4084	208.4001
2.0525	0.4381	18.6868	23.4458	64.4815	147.1758
1.8278	0.5525	29.7132	18.5933	57.4224	103.9381
1.7249	0.6204	37.4677	16.5578	54.1881	87.3462
1.6277	0.6966	47.2460	14.7452	51.1361	73.4029
1.5360	0.7823	59.5761	13.1309	48.2559	61.6854

Diameter mm	Resistance at 20° C Ω/m	Resistance at 20° C Ω/kg	Weight kg/1000 m	Surface area cm ² /m	cm ² /Ω at 20°C
1.4495	0.8785	75.1242	11.6934	45.5380	51.8384
1.3679	0.9865	94.7300	10.4133	42.9731	43.5633
1.2908	1.1077	119.4525	9.2733	40.5527	36.6092
1.2181	1.2439	150.6271	8.2581	38.2686	30.7652
1.1495	1.3968	189.9375	7.3540	36.1132	25.8541
1.0848	1.5685	239.5071	6.5490	34.0792	21.7269
1.0237	1.7613	302.0134	5.8320	32.1597	18.2586
0.9660	1.9779	380.8324	5.1936	30.3483	15.3439
0.9116	2.2210	480.2214	4.6250	28.6390	12.8945
0.8603	2.4941	605.5489	4.1187	27.0260	10.8361
0.8118	2.8007	763.5842	3.6678	25.5038	9.1063
0.7661	3.1450	962.8633	3.2662	24.0673	7.6527
0.7229	3.5316	1214.1499	2.9087	22.7117	6.4311
0.6822	3.9657	1531.0169	2.5903	21.4325	5.4045
0.6438	4.4532	1930.5795	2.3067	20.2254	4.5417
0.6075	5.0007	2434.4193	2.0542	19.0862	3.8167
0.5733	5.6154	3069.7504	1.8293	18.0112	3.2074
0.5410	6.3058	3870.8893	1.6290	16.9967	2.6954
0.5106	7.0809	4881.1083	1.4507	16.0394	2.2652
0.4818	7.9514	6154.9727	1.2919	15.1360	1.9036
0.4547	8.9289	7761.2884	1.1504	14.2835	1.5997
0.4291	10.0266	9786.8180	1.0245	13.4790	1.3443
0.4049	11.2592	12340.9673	0.9123	12.7198	1.1297
0.3821	12.6433	15561.6947	0.8125	12.0034	0.9494
0.3606	14.1976	19622.9628	0.7235	11.3273	0.7978
0.3403	15.9429	24744.1346	0.6443	10.6893	0.6705
0.3211	17.9028	31201.8223	0.5738	10.0873	0.5634
0.2859	22.5751	49612.9828	0.4550	8.9830	0.3979
0.2546	28.4667	78887.9585	0.3608	7.9996	0.2810
0.2268	35.8959	125437.1264	0.2862	7.1238	0.1985
0.2019	45.2639	199453.4145	0.2269	6.3439	0.1402
0.1798	57.0769	317144.2594	0.1800	5.6494	0.0990
0.1601	71.9727	504280.5686	0.1427	5.0310	0.0699
0.1426	90.7560	801839.8072	0.1132	4.4802	0.0494
0.1270	114.4414	1274978.8837	0.0898	3.9897	0.0349
0.1131	144.3082	2027301.6373	0.0712	3.5529	0.0246
0.1007	181.9695	3223545.0963	0.0565	3.1640	0.0174
0.0897	229.4596	5125652.1461	0.0448	2.8176	0.0123
0.0799	289.3436	8150129.4811	0.0355	2.5092	0.0087
0.0711	364.8561	12959250.5822	0.0282	2.2345	0.0061
0.0633	460.0757	20606074.5465	0.0223	1.9898	0.0043
0.0564	580.1456	32765035.7190	0.0177	1.7720	0.0031
0.0502	731.5512	52098596.6175	0.0140	1.5780	0.0022
0.0447	922.4703	82840250.5887	0.0111	1.4053	0.0015
0.0398	1163.2153	131721534.9961	0.0088	1.2514	0.0011
0.0355	1466.7894	209446044.1444	0.0070	1.1144	0.0008
0.0316	1849.5900	333033208.3439	0.0056	0.9924	0.0005
0.0281	2332.2933	529545059.2678	0.0044	0.8838	0.0004
0.0251	2940.9717	842012035.9448	0.0035	0.7870	0.0003

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