

Resistance Heating Wire Iron-Chrome-Aluminum (Fe-Cr-Al) Alloy - 1JR®

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

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

Common Names: No. 1JR® Alloy (Types 1, 2 and 4); Alkrothal® 720

Uses: Oxidation-resistant steel offering an excellent combination of electrical resistance and scale resistance. Resistivity of the three types in ohms - cir mil/ft at 68° F is: Type1, 720; Type 2, 680; Type 4, 656. Electric wire wound and edge wound resistors and braking resistors. Also, magnetic core material where resistance to oxidation and corrosion are required.

Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
None/Trace	12 - 14%	Balance	3 - 4%	None/Trace	None/Trace	None/Trace	0.15% max.	0.70% max.	None/Trace	None/Trace

Technical Data

Resistivity (Ω/cm²)	720	Resistivity (Ω/sqmf)	565
Resistivity (μΩ/cm)	120	Nom. Temp. Coeff. of Resistance (TCR)	0.000068
Std. Res. Tol. <.020"	5%	Std. Res. Tol. >.020"	3%
Thermal EMF vs. Cu		Specific Heat (20°C)	0.11 cal/g
Density (g/cm³)	7.335	Density (lb/in³)	0.265
Thermal Conductivity	0.173 W/cm/°C	Coeff. of Linear Expansion (X 10⁻⁶)	11.50 in/in/°C
Approx. Melting Point	1500 °C	Max. Continuous Operating Temp.	1000°C
UTS – Hard (KPSI)		YTS Tensile – Hard (KPSI)	
UTS – Stress Relieved (KPSI)		YTS Tensile – Stress Relieved (KPSI)	
UTS – Annealed (KPSI)	86	YTS Tensile – Annealed (KPSI)	
Magnetic Attraction	Strong	Emissivity – fully oxidized	
Designations/Specifications	ASTM-A341	Forms Available	Wire, Ribbon, Square

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	0.0141	0.0226	623.7037	326.8804	23221.0501
9.2658	0.0178	0.0359	494.6188	291.0952	16399.1116
8.2515	0.0224	0.0571	392.2500	259.2276	11581.3393
7.3481	0.0282	0.0907	311.0679	230.8486	8178.9443
6.5437	0.0356	0.1443	246.6877	205.5765	5776.1135
5.8273	0.0449	0.2294	195.6320	183.0710	4079.1923
5.1894	0.0566	0.3648	155.1430	163.0293	2880.7970
4.6213	0.0714	0.5800	123.0338	145.1817	2034.4692
4.1154	0.0900	0.9223	97.5701	129.2880	1436.7777
3.6648	0.1135	1.4664	77.3765	115.1342	1014.6775
3.2636	0.1431	2.3318	61.3623	102.5299	716.5830
2.9063	0.1804	3.7076	48.6624	91.3054	506.0635
2.5882	0.2275	5.8954	38.5910	81.3098	357.3909
2.3048	0.2869	9.3741	30.6040	72.4084	252.3957
2.0525	0.3618	14.9054	24.2700	64.4815	178.2462
1.8278	0.4562	23.7006	19.2470	57.4224	125.8806
1.7249	0.5122	29.8859	17.1399	54.1881	105.7860
1.6277	0.5752	37.6855	15.2635	51.1361	88.8991
1.5360	0.6459	47.5207	13.5926	48.2559	74.7079
1.4495	0.7253	59.9225	12.1045	45.5380	62.7821
1.3679	0.8145	75.5610	10.7794	42.9731	52.7600
1.2908	0.9146	95.2808	9.5993	40.5527	44.3378
1.2181	1.0271	120.1471	8.5484	38.2686	37.2601
1.1495	1.1533	151.5029	7.6126	36.1132	31.3121
1.0848	1.2951	191.0419	6.7792	34.0792	26.3137
1.0237	1.4543	240.8997	6.0370	32.1597	22.1132
0.9660	1.6331	303.7694	5.3761	30.3483	18.5832
0.9116	1.8339	383.0466	4.7876	28.6390	15.6167
0.8603	2.0593	483.0136	4.2635	27.0260	13.1238
0.8118	2.3125	609.0697	3.7967	25.5038	11.0288

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
0.7661	2.5967	768.0239	3.3811	24.0673	9.2682
0.7229	2.9160	968.4616	3.0109	22.7117	7.7887
0.6822	3.2744	1221.2093	2.6813	21.4325	6.5454
0.6438	3.6770	1539.9187	2.3878	20.2254	5.5005
0.6075	4.1290	1941.8044	2.1264	19.0862	4.6225
0.5733	4.6366	2448.5736	1.8936	18.0112	3.8846
0.5410	5.2066	3087.5987	1.6863	16.9967	3.2645
0.5106	5.8466	3893.3957	1.5017	16.0394	2.7434
0.4818	6.5654	4909.4884	1.3373	15.1360	2.3054
0.4547	7.3725	6190.7594	1.1909	14.2835	1.9374
0.4291	8.2788	7806.4146	1.0605	13.4790	1.6281
0.4049	9.2966	9843.7212	0.9444	12.7198	1.3682
0.3821	10.4394	12412.7210	0.8410	12.0034	1.1498
0.3606	11.7228	15652.1746	0.7490	11.3273	0.9663
0.3403	13.1639	19737.0560	0.6670	10.6893	0.8120
0.3211	14.7822	24888.0037	0.5939	10.0873	0.6824
0.2859	18.6400	39573.5892	0.4710	8.9830	0.4819
0.2546	23.5046	62924.6517	0.3735	7.9996	0.3403
0.2268	29.6388	100054.4017	0.2962	7.1238	0.2404
0.2019	37.3739	159093.1858	0.2349	6.3439	0.1697
0.1798	47.1277	252968.7982	0.1863	5.6494	0.1199
0.1601	59.4270	402237.2962	0.1477	5.0310	0.0847
0.1426	74.9362	639584.1841	0.1172	4.4802	0.0598
0.1270	94.4929	1016981.5988	0.0929	3.9897	0.0422
0.1131	119.1535	1617068.7112	0.0737	3.5529	0.0298
0.1007	150.2500	2571247.3263	0.0584	3.1640	0.0211
0.0897	189.4621	4088455.0960	0.0463	2.8176	0.0149
0.0799	238.9076	6500916.8511	0.0367	2.5092	0.0105
0.0711	301.2574	10336892.2767	0.0291	2.2345	0.0074
0.0633	379.8790	16436349.5777	0.0231	1.9898	0.0052
0.0564	479.0193	26134894.3384	0.0183	1.7720	0.0037
0.0502	604.0331	41556228.7023	0.0145	1.5780	0.0026
0.0447	761.6727	66077181.0131	0.0115	1.4053	0.0018
0.0398	960.4530	105067134.0249	0.0091	1.2514	0.0013
0.0355	1211.1106	167063765.1753	0.0072	1.1144	0.0009
0.0316	1527.1844	265642552.1982	0.0057	0.9924	0.0006
0.0281	1925.7467	422389411.9969	0.0046	0.8838	0.0005
0.0251	2428.3253	671627395.1244	0.0036	0.7870	0.0003

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