Hyndman Industrial Products Inc.

Alloy Data Table –
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Resistance Wire for Low Temp Heating or Resistors Pure Nickel Alloy - NI205

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

I = Current
C_t = Temperature factor
p = Surface load W/in^2

Common Names: Nickel 205, Nickel Alloy 205, Alloy 205, 205 Alloy, Alloy K205

Uses: Used for everything from resistors, heating applications, mechanical components, food-handling equipment, magnetically actuated parts, sonar devices, electrical and electronic leads, and springs. Commercially pure wrought Nickel with good mechanical properties over a wide range of temperature and excellent resistance to many corrosives, in particular hydroxides. Good resistance to corrosion in acids and alkalis and is most useful under reducing conditions. Outstanding resistance to caustic alkalis up to and including the molten state. In acid, alkaline and neutral salt solutions the material shows good resistance, but in oxidizing salt solutions severe attack will occur. Resistant to all dry gases at room temperature and in dry chlorine and hydrogen chloride may be used in temperatures up to 550ºC. Resistance to mineral acids varies according to temperature and concentration and whether the solution is aerated or not. Corrosion resistance is better in de-aerated acid.

Composition

Ni	Cr	Fe	Al	Si	Mn	Cu	C	Ti	Mo	W
99.45%	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace	None/Trace

Technical Data

Resistivity (Ω/cmf)	57	**Resistivity (Ω/sqmf)**	44
Resistivity (μΩ/cm)	9.48	**Nom. Temp. Coeff. of Resistance (TCR)**	0.00480
Std. Res. Tol. <.020"	3%	**Std. Res. Tol. >.020"**	5%
Thermal EMF vs. Cu	-0.022	**Specific Heat (20°C)**	0.109 cal/g
Density (g/cm^3)	8.90	**Density (lb/in^3)**	0.322
Thermal Conductivity	0.616 W/cm/°C	**Coeff. of Linear Expansion (X 10^{-6})**	13.00 in/in/°C
Approx. Melting Point	1450°C	**Max. Continuous Operating Temp.**	1100°C
UTS – Hard (KPSI)	135	**YTS Tensile – Hard (KPSI)**	105
UTS – Stress Relieved (KPSI)	115	**YTS Tensile – Stress Relieved (KPSI)**	80
UTS – Annealed (KPSI)	60	**YTS Tensile – Annealed (KPSI)**	25
Magnetic Attraction	Strong	**Emissivity – fully oxidized**	
Designations/Specifications	ASTM = B267, F9	**Forms Available**	Wire, Ribbon, Insul.

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	0.0011	0.0015	757.8588	326.8804	293318.5271
9.2658	0.0014	0.0023	601.0085	291.0952	207146.6724
8.2515	0.0018	0.0037	476.6207	259.2276	146290.6019
7.3481	0.0022	0.0059	377.9769	230.8486	103312.9809
6.5437	0.0028	0.0094	299.7489	205.5765	72961.4335
5.8273	0.0036	0.0149	237.7113	183.0710	51526.6400
5.1894	0.0045	0.0238	188.5134	163.0293	36389.0141
4.6213	0.0056	0.0378	149.4977	145.1817	25698.5580
4.1154	0.0071	0.0601	118.5569	129.2880	18148.7710
3.6648	0.0090	0.0955	94.0198	115.1342	12816.9794
3.2636	0.0113	0.1519	74.5609	102.5299	9051.5750
2.9063	0.0143	0.2416	59.1294	91.3054	6392.3805
2.5882	0.0180	0.3841	46.8917	81.3098	4514.4109
2.3048	0.0227	0.6107	37.1868	72.4084	3188.1559
2.0525	0.0286	0.9711	29.4904	64.4815	2251.5314
1.8278	0.0361	1.5442	23.3869	57.4224	1590.0709
1.7249	0.0406	1.9472	20.8266	54.1881	1336.2438
1.6277	0.0455	2.4553	18.5466	51.1361	1122.9358
1.5360	0.0511	3.0961	16.5162	48.2559	943.6788
1.4495	0.0574	3.9041	14.7081	45.5380	793.0369

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
1.3679	0.0645	4.9230	13.0980	42.9731	666.4424
1.2908	0.0724	6.2078	11.6641	40.5527	560.0565
1.2181	0.0813	7.8279	10.3871	38.2686	470.6533
1.1495	0.0913	9.8708	9.2500	36.1132	395.5217
1.0848	0.1025	12.4469	8.2374	34.0792	332.3836
1.0237	0.1151	15.6953	7.3356	32.1597	279.3244
0.9660	0.1293	19.7914	6.5325	30.3483	234.7351
0.9116	0.1452	24.9565	5.8174	28.6390	197.2637
0.8603	0.1630	31.4696	5.1805	27.0260	165.7740
0.8118	0.1831	39.6825	4.6134	25.5038	139.3111
0.7661	0.2056	50.0388	4.1083	24.0673	117.0725
0.7229	0.2308	63.0979	3.6586	22.7117	98.3839
0.6822	0.2592	79.5651	3.2580	21.4325	82.6787
0.6438	0.2911	100.3298	2.9014	20.2254	69.4805
0.6075	0.3269	126.5138	2.5837	19.0862	58.3891
0.5733	0.3671	159.5312	2.3009	18.0112	49.0683
0.5410	0.4122	201.1654	2.0490	16.9967	41.2354
0.5106	0.4629	253.6652	1.8247	16.0394	34.6529
0.4818	0.5198	319.8664	1.6249	15.1360	29.1212
0.4547	0.5837	403.3446	1.4470	14.2835	24.4725
0.4291	0.6554	508.6089	1.2886	13.4790	20.5659
0.4049	0.7360	641.3449	1.1476	12.7198	17.2829
0.3821	0.8265	808.7222	1.0219	12.0034	14.5240
0.3606	0.9281	1019.7813	0.9101	11.3273	12.2055
0.3403	1.0421	1285.9223	0.8104	10.6893	10.2571
0.3211	1.1703	1621.5204	0.7217	10.0873	8.6197
0.2859	1.4757	2578.3258	0.5723	8.9830	6.0874
0.2546	1.8608	4099.7104	0.4539	7.9996	4.2990
0.2268	2.3464	6518.8136	0.3599	7.1238	3.0360
0.2019	2.9588	10365.3493	0.2854	6.3439	2.1441
0.1798	3.7309	16481.5981	0.2264	5.6494	1.5142
0.1601	4.7046	26206.8425	0.1795	5.0310	1.0694
0.1426	5.9324	41670.6310	0.1424	4.4802	0.7552
0.1270	7.4807	66259.0884	0.1129	3.9897	0.5333
0.1131	9.4330	105356.3789	0.0895	3.5529	0.3767
0.1007	11.8948	167523.6838	0.0710	3.1640	0.2660
0.0897	14.9991	266373.8536	0.0563	2.8176	0.1879
0.0799	18.9135	423552.2301	0.0447	2.5092	0.1327
0.0711	23.8495	673476.3537	0.0354	2.2345	0.0937
0.0633	30.0738	1070872.4136	0.0281	1.9898	0.0662
0.0564	37.9224	1702758.7085	0.0223	1.7720	0.0467
0.0502	47.8193	2707500.1490	0.0177	1.5780	0.0330
0.0447	60.2991	4305106.1905	0.0140	1.4053	0.0233
0.0398	76.0359	6845406.5711	0.0111	1.2514	0.0165
0.0355	95.8796	10884653.9552	0.0088	1.1144	0.0116
0.0316	120.9021	17307327.2557	0.0070	0.9924	0.0082
0.0281	152.4549	27519807.0575	0.0055	0.8838	0.0058
0.0251	192.2424	43758332.4851	0.0044	0.7870	0.0041