

# Resistance Wire

MWS offers many nickel based alloys that are used in RTD sensors, resistors, rheostats, voltage control relays, heating elements, potentiometers, and other components. Engineers design around properties unique to each alloy. These include resistance, thermoelectric properties, high tensile strength, coefficient of expansion, magnetic attraction, and resistance to oxidation or corrosive environments. Wires can be provided as bare or insulated. Most alloys can also be made as flat wire.

## Properties of Major Alloys

MATERIAL	COMPOSITION (%)	RESISTIVITY AT 20°C		COEFFICIENT OF LINEAR EXPANSION	TENSILE STRENGTH (KPSI AT 20°C)		DENSITY	SPECIFIC GRAVITY	MAGNETIC ATTRACTION	MELTING POINT APPROX
		OHMS/CMF	TCR (0-100°C)	µm/m (0-100°C)	MIN.	MAX.	lb/in <sup>3</sup>			(°C)
MWS-875	22.5 Cr, 5.5 Al, .5 Si, .1 C, bal. Fe	875	0.00002	0.000012	105	175	0.256	7.10	Strong	1,520
MWS-800	75 Ni, 20 Cr, 2.5 Al, 2.5 Cu	800	0.00002	0.000014	100	200	0.293	8.10	None	1,350
MWS-675	61 Ni, 15 Cr, bal. Fe	675	0.00013	0.000014	95	175	0.298	8.25	Faint	1,350
MWS-650	80 Ni, 20 Cr	650	0.0001	0.000013	100	200	0.304	8.41	None	1,400
ALLOY 42	42 Ni, bal. Fe	390	0.001	0.000003	70	150	0.295	8.10	Strong	1,425
MWS-294	55 Cu, 45 Ni	294	0.000020*	0.000015	60	135	0.321	8.90	None	1,210
MWS-294R	29 Ni, 17 Co, bal. Fe	294	0.0033	0.000003	65	150	0.302	8.36	Strong	1,450
MANGANIN	13 Mn, 4 Ni, bal. Cu	290	0.000015**	0.000019	40	90	0.296	8.19	None	1,020
ALLOY 52	50.5 Ni, bal. Fe	260	0.0029	0.000005	70	150	0.301	8.25	Strong	1,425
MWS-180	23 Ni, bal. Cu	180	0.00018	0.000016	50	100	0.321	8.90	None	1,100
MWS-120	70 Ni, 30 Fe	120	0.0045	0.000015	70	150	0.305	8.46	Strong	1,425
MWS-90	12 Ni, bal. Cu	90	0.0004	0.000016	35	75	0.321	8.90	None	1,100
MWS-60	6 Ni, bal. Cu	60	0.0005	0.000016	35	70	0.321	8.90	None	1,100
MWS-30	2 Ni, bal. Cu	30	0.0013	0.000017	30	60	0.321	8.90	None	1,100
NICKEL 205	99 Ni	57	0.0048	0.000013	60	135	0.321	8.90	Strong	1,450
NICKEL 270	99.9 Ni	45	0.0067	0.000013	48	95	0.321	8.89	Strong	1,452

\*TCR at 25-105°C \*\*TCR at 15-35°C Note: Available bare or insulated. See pages 4 and 5 for available insulations.

## Trade Name Cross Reference

MWS WIRE IND.	CARPENTER TECH.	DRIVER-HARRIS	HARRISON	HOSKINS	JELLIFF	KANTHAL	MOLECU
MWS-875	Alchrome 875		HAI-FeCr Al 25	Alloy 875		Kanthal A-I	
MWS-800	Evanohm	Karma	HAI-431	Chromel R	Alloy 800	Nikrothal L	Moleculoy
MWS-675	Tophet C	Nichrome	HAI-NiCr 60	Chromel C	Alloy C	Nikrothal 6	Electroloy
MWS-650	Tophet A	Nichrome V	HAI-NiCr 80	Chromel A	Alloy A	Nikrothal 8	Protoloy
MWS-294	Cupron	Advance	HAI-CuNi 102	Copel	Alloy 45	Cuprothal 294	Neutroloy
MWS-294R	Kovar		HAI-373				
MWS-180	180 Alloy	Midohm	HAI-180	Alloy 380	Alloy 180	Cuprothal 180	
MWS-120	Balco	Hytemco	HAI-380		Alloy 120		Pelcoloy
MWS-90	90 Alloy	#95 Alloy	HAI-90	Alloy 290	Alloy 90	Cuprothal 90	
MWS-60	60 Alloy	Lohm	HAI-60	Alloy 260	Alloy 60	Cuprothal 60	
MWS-30	30 Alloy	#30 Alloy	HAI-30	Alloy 230	Alloy 30	Cuprothal 30	

SIZE (AWG)	DIA. (INCHES)	NOMINAL OHMS											
		NI 270	NI 205	MWS 875	MWS 800	MWS 675	MWS 650	MANGANIN	MWS 294	MWS 120	ALLOY 180	ALLOY 90	ALLOY 30
Resistivity		0.000045	0.000057	0.000875	0.000800	0.000675	0.000650	0.000290	0.000294	0.000120	0.000180	0.000090	0.000030
6	0.1620	0.0017	0.0022	0.0333	0.0305	0.0257	0.0248	0.0111	0.0112	0.0046	0.0069	0.0034	0.0011
7	0.1440	0.0022	0.0027	0.0422	0.0386	0.0326	0.0313	0.0140	0.0142	0.0058	0.0087	0.0043	0.0014
8	0.1280	0.0027	0.0035	0.0534	0.0488	0.0412	0.0397	0.0177	0.0179	0.0073	0.0110	0.0055	0.0018
9	0.1140	0.0035	0.0044	0.0673	0.0616	0.0519	0.0500	0.0223	0.0226	0.0092	0.0139	0.0069	0.0023
10	0.1020	0.0043	0.0055	0.0841	0.0769	0.0649	0.0625	0.0279	0.0283	0.0115	0.0173	0.0087	0.0029
11	0.0910	0.0054	0.0069	0.1057	0.0966	0.0815	0.0785	0.0350	0.0355	0.0145	0.0217	0.0109	0.0036
12	0.0808	0.0069	0.0087	0.1340	0.1225	0.1034	0.0996	0.0444	0.0450	0.0184	0.0276	0.0138	0.0046
13	0.0720	0.0087	0.0110	0.1688	0.1543	0.1302	0.1254	0.0559	0.0567	0.0231	0.0347	0.0174	0.0058
14	0.0641	0.0110	0.0139	0.2130	0.1947	0.1643	0.1582	0.0706	0.0716	0.0292	0.0438	0.0219	0.0073
15	0.0571	0.0138	0.0175	0.2684	0.2454	0.2070	0.1994	0.0889	0.0902	0.0368	0.0552	0.0276	0.0092
16	0.0508	0.0174	0.0221	0.3391	0.3100	0.2616	0.2519	0.1124	0.1139	0.0465	0.0698	0.0349	0.0116
17	0.0453	0.0219	0.0278	0.4264	0.3898	0.3289	0.3168	0.1413	0.1433	0.0585	0.0877	0.0439	0.0146
18	0.0403	0.0277	0.0351	0.5388	0.4926	0.4156	0.4002	0.1786	0.1810	0.0739	0.1108	0.0554	0.0185
19	0.0359	0.0349	0.0442	0.6789	0.6207	0.5237	0.5043	0.2250	0.2281	0.0931	0.1397	0.0698	0.0233
20	0.0320	0.0439	0.0557	0.8545	0.7813	0.6592	0.6348	0.2832	0.2871	0.1172	0.1758	0.0879	0.0293
21	0.0285	0.0554	0.0702	1.0773	0.9849	0.8310	0.8002	0.3570	0.3620	0.1477	0.2216	0.1108	0.0369
22	0.0253	0.0703	0.0890	1.3670	1.2498	1.0545	1.0155	0.4531	0.4593	0.1875	0.2812	0.1406	0.0469
23	0.0226	0.0881	0.1116	1.7131	1.5663	1.3216	1.2726	0.5678	0.5756	0.2349	0.3524	0.1762	0.0587
24	0.0201	0.1114	0.1411	2.1658	1.9801	1.6708	1.6089	0.7178	0.7277	0.2970	0.4455	0.2228	0.0743
25	0.0179	0.1404	0.1779	2.7309	2.4968	2.1067	2.0287	0.9051	0.9176	0.3745	0.5618	0.2809	0.0936
26	0.0159	0.1780	0.2255	3.4611	3.1644	2.6700	2.5711	1.1471	1.1629	0.4747	0.7120	0.3560	0.1187
27	0.0142	0.2232	0.2827	4.3394	3.9675	3.3476	3.2236	1.4382	1.4580	0.5951	0.8927	0.4463	0.1488
28	0.0126	0.2834	0.3590	5.5115	5.0391	4.2517	4.0942	1.8267	1.8519	0.7559	1.1338	0.5669	0.1890
29	0.0113	0.3524	0.4464	6.8525	6.2652	5.2862	5.0905	2.2711	2.3025	0.9398	1.4097	0.7048	0.2349
30	0.0100	0.4500	0.5700	8.7500	8.0000	6.7500	6.5000	2.9000	2.9400	1.2000	1.8000	0.9000	0.3000
31	0.0089	0.5681	0.7196	11.0466	10.0997	8.5217	8.2060	3.6612	3.7117	1.5150	2.2724	1.1362	0.3787
32	0.0080	0.7031	0.8906	13.6719	12.5000	10.5469	10.1563	4.5313	4.5938	1.8750	2.8125	1.4063	0.4688
33	0.0071	0.8927	1.1307	17.3577	15.8699	13.3902	12.8943	5.7528	5.8322	2.3805	3.5707	1.7854	0.5951
34	0.0063	1.1338	1.4361	22.0459	20.1562	17.0068	16.3769	7.3066	7.4074	3.0234	4.5351	2.2676	0.7559
35	0.0056	1.4349	1.8176	27.9018	25.5102	21.5242	20.7270	9.2474	9.3750	3.8265	5.7398	2.8699	0.9566
36	0.0050	1.8000	2.2800	35.0000	32.0000	27.0000	26.0000	11.6000	11.7600	4.8000	7.2000	3.6000	1.2000
37	0.0045	2.2222	2.8148	43.2099	39.5062	33.3333	32.0988	14.3210	14.5185	5.9259	8.8889	4.4444	1.4815
38	0.0040	2.8125	3.5625	54.6875	50.0000	42.1875	40.6250	18.1250	18.3750	7.5000	11.2500	5.6250	1.8750
39	0.0035	3.6735	4.6531	71.4286	65.3061	55.1020	53.0612	23.6735	24.0000	9.7959	14.6939	7.3469	2.4490
40	0.0031	4.6826	5.9313	91.0510	83.2466	70.2393	67.6379	30.1769	30.5931	12.4870	18.7305	9.3652	3.1217
41	0.0028	5.7398	7.2704	111.6071	102.0408	86.0969	82.9082	36.9898	37.5000	15.3061	22.9592	11.4796	3.8265
42	0.0025	7.2000	9.1200	140.0000	128.0000	108.0000	104.0000	46.4000	47.0400	19.2000	28.8000	14.4000	4.8000
43	0.0022	9.2975	11.7769	180.7851	165.2893	139.4628	134.2975	59.9174	60.7438	24.7934	37.1901	18.5950	6.1983
44	0.0020	11.2500	14.2500	218.7500	200.0000	168.7500	162.5000	72.5000	73.5000	30.0000	45.0000	22.5000	7.5000
45	0.0018	14.5274	18.4013	282.4768	258.2645	217.9106	209.8399	93.6209	94.9122	38.7397	58.1095	29.0548	9.6849
46	0.0016	18.2563	23.1247	354.9840	324.5568	273.8448	263.7024	117.6518	119.2746	48.6835	73.0253	36.5126	12.1709
47	0.0014	22.9592	29.0816	446.4286	408.1633	344.3878	331.6327	147.9592	150.0000	61.2245	91.8367	45.9184	15.3061
48	0.0012	29.2664	37.0708	569.0687	520.2914	438.9958	422.7367	188.6056	191.2071	78.0437	117.0656	58.5328	19.5109
49	0.0011	36.5230	46.2625	710.1696	649.2979	547.8451	527.5546	235.3705	238.6170	97.3947	146.0920	73.0460	24.3487
50	0.0010	45.9137	58.1573	892.7660	816.2432	688.7052	663.1976	295.8882	299.9694	122.4365	183.6547	91.8274	30.6091
51	0.0009	58.1095	73.6054	1129.9070	1033.0579	871.6426	839.3595	374.4835	379.6488	154.9587	232.4380	116.2190	38.7397
52	0.0008	73.9645	93.6884	1438.1986	1314.9244	1109.4675	1068.3761	476.6601	483.2347	197.2387	295.8580	147.9290	49.3097
53	0.0007	91.8367	116.3265	1785.7143	1632.6531	1377.5510	1326.5306	591.8367	600.0000	244.8980	367.3469	183.6735	61.2245
54	0.0006	117.0656	148.2830	2276.2747	2081.1655	1755.9834	1690.9469	754.4225	764.8283	312.1748	468.2622	234.1311	78.0437
55	0.0006	148.7603	188.4298	2892.5620	2644.6281	2231.4050	2148.7603	958.6777	971.9008	396.6942	595.0413	297.5207	99.1736