

ELECTROTECHNOLOGY
ELTK1100
ASSIGNMENT #6

1. Find the resistance (@ 20°C) of the following wires;
- (a) 50000 ft. of copper 0.258" in diameter.
 - (b) 1.5 miles of #8 aluminum.
 - (c) 800 m of manganin 0.259 cm. in diameter.
 - (d) 250 ft of brass 0.075" in diameter.

2. Find the resistance (@ 40°C) of the following wires;
- (a) 50000 ft. of copper 0.258" in diameter.
 - (b) 1.5 miles of #8 aluminum.

Hint: Use 1 (a) and (b) as your starting point.

3. Find the resistance (@ 5°C) of the following wires;
- (a) 800 m of manganin 0.259 cm. in diameter
 - (b) 250 ft of brass 0.075" in diameter.

Hint: Use 1 (c) and (d) as your starting point.

4. A 850 ft. conductor with a diameter of 0.08" has a resistance of 79.7Ω @ 20°C. What material is the conductor made of?
5. 125 m. of a 0.812 mm diameter conductor has a resistance of 4.15Ω @ 20°C. What material is the conductor made of?
6. What length of 000 copper wire has a resistance of 5Ω @ 20°C?
7. What length of 000 copper wire has a resistance of 5Ω @ 30°C?
8. A conductor has a resistance of 50Ω @ 10°C. The conductors resistance increases to 61.8Ω @ 70°C. What material is the conductor made of?
9. A coil of copper wire has a resistance of 150Ω @ 20°C. After several hours of operation, the resistance of the coil has increased to 180Ω . Find the temperature of the coil.

Properties of Common Conducting Materials

Material	Resistivity ρ ($\Omega \cdot m$ @20°C)	Resistivity ρ ($\Omega \cdot CM/ft$ @20°C)	Temperature Coefficient ($\Omega/^\circ C \cdot \Omega$ @ 0°C)
Aluminum	2.83×10^{-8}	17.0	0.00424
Brass	7.00×10^{-8}	42.0	0.00208
Carbon	3500×10^{-8}	21000	-0.000495
Constantin (Cu, Ni)	49.2×10^{-8}	295	0.00000
Copper	1.72×10^{-8}	10.37	0.00427
Gold	2.45×10^{-8}	14.7	0.00365
Lead	22.1×10^{-8}	132.0	0.00466
Manganin (Cu, Mn, Ni)	48.0×10^{-8}	288	0.00000
Nichrome (Ni, Fe, Cr)	100×10^{-8}	600.0	0.00044
Nickel	7.80×10^{-8}	47.0	0.00680
Platinum	10.0×10^{-8}	60.2	0.00323
Silver	1.64×10^{-8}	9.90	0.00410
Tungsten	5.52×10^{-8}	33.2	0.00495

American Wire Gage

AWG #	Area (CM)	$\Omega/1000$ ft @20°C	$\Omega/100$ m @20°C
0000	211,600	0.0490	0.0160
000	167,810	0.0618	0.0200
00	133,080	0.0780	0.0260
0	105,530	0.0983	0.0320
1	83,694	0.1240	0.0406
2	66,373	0.1563	0.0512
3	52,634	0.1970	0.0646
4	41,742	0.2485	0.0815
5	33,102	0.3133	0.1027
6	26,250	0.3951	0.129
7	20,816	0.4982	0.163
8	16,509	0.6282	0.206
9	13,094	0.7921	0.260
10	10,381	0.9989	0.327
11	8,234.0	1.260	0.413
12	6,529.0	1.588	0.520
13	5,178.4	2.003	0.657
14	4,106.8	2.525	0.828
15	3,256.7	3.184	1.043
16	2,582.9	4.016	1.316
17	2,048.2	5.064	1.66
18	1,624.3	6.385	2.09

AWG #	Area (CM)	$\Omega/1000$ ft @20°C	$\Omega/100$ m @20°C
19	1,288.1	8.051	2.64
20	1,021.5	10.15	3.33
21	810.10	12.80	4.20
22	642.40	16.14	5.30
23	509.45	20.36	6.70
24	404.01	25.67	8.40
25	320.40	32.37	10.6
26	254.10	40.81	13.4
27	201.50	51.47	16.9
28	159.79	64.90	21.3
29	126.72	81.83	26.8
30	100.50	103.2	33.8
31	79.70	130.1	42.6
32	63.21	164.1	53.8
33	50.13	206.9	68.0
34	39.75	260.9	86.0
35	31.52	329.0	108
36	25.00	414.8	136
37	19.83	523.1	171
38	15.72	659.6	216
39	12.47	831.8	273
40	9.89	1049.0	344

NOTE: The $\Omega/1000$ ft and $\Omega/100$ m columns are for **COPPER WIRE ONLY!**