

Wire Gauge and Characteristics

Electrical wiring in homes and businesses consist of wires with a circular cross-section. They come in a variety of sizes, often referred to as the wire **gauge**. The American Wire Gauge (AWG) is a standardized system for expressing the size of a round, solid, non-iron conducting wire. While most of the wires used in household circuits are 12-gauge and 14-gauge, wires of other sizes are used for hobby applications (e.g., train layouts, speaker wiring) and long-distance power transmission. The gauge of a wire indicates information about the diameter, cross-sectional area, and expected resistance. **Table 1** illustrates these relationships for several gauges.

The amount of current that can be safely *carried* by a wire is affected by the wire gauge. A variety of factors in addition to gauge affect this current-carrying capacity - referred to as **ampacity**. Such characteristics include the nature of the insulating material wrapped around the wire, the temperature of the surroundings, the number of nearby wires, etc. The National Electrical Code (NEC) provides guidelines for the safe installation of electrical wiring in the United States. **Table 2** lists ampacities for various gauge wires used in houses, business, and for power transmission.

Ratings apply to wires having plastic insulation with temperature ratings of 60°C, 75°C and 90°C.

Table 1

AWG	Diameter (mm)	Area (mm ²)	Copper Wire Resistance (Ω/m)
32	0.202	0.0320	0.538
28	0.321	0.0810	0.213
24	0.511	0.205	0.0842
22	0.644	0.326	0.0529
20	0.812	0.518	0.0333
18	1.02	0.823	0.0209
16	1.29	1.31	0.0132
14	1.63	2.08	0.00828
13	1.83	2.62	0.00657
12	2.05	3.31	0.00521
11	2.31	4.17	0.00413
10	2.59	5.26	0.00328
9	2.91	6.63	0.00260
8	3.26	8.37	0.00206
6	4.12	13.3	0.00130
5	4.62	16.8	0.00103
4	5.19	21.2	0.000815

Table 2

AWG	Ampacity (A) at T =		
	60°C	75°C	90°C
14	20	20	25
12	25	25	30
10	30	35	40
8	40	50	55
6	55	65	75
4	70	85	95

From <http://www.usawire-cable.com/pdfs/NEC%20AMPACITIES.pdf>