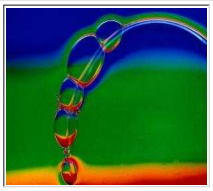
Wire Gauge and Current Limits

					
More Engineering Resources	NEW! Commercially available Fuel Cell for immediate applications	**New: Clamp-on DC Ammeters**	**Music stand lights and piano music lights battery powered and AC powered**	**Power Supplies** including DC/DC Converters	**Inexpensive Spot Welders**

AWG Wire Sizes (see table below)

AWG: In the American Wire Gauge (AWG), diameters can be calculated by applying the formula $D(AWG)=.005 \cdot 92^{((36-AWG)/39)}$ inch. For the 00, 000, 0000 etc. gauges you use -1, -2, -3, which makes more sense mathematically than "double nought." This means that in American wire gage every 6 gauge decrease gives a doubling of the wire diameter, and every 3 gauge decrease doubles the wire cross sectional area. Similar to dB in signal and power levels. An approximate form of this formula contributed by Mario Rodriguez is $D = .460 * (57/64)^{(awg+3)}$ or $D = .460 * (0.890625)^{(awg+3)}$.

Metric Wire Gauges (see table below)

Metric Gauge: In the Metric Gauge scale, the gauge is 10 times the diameter in millimeters, so a 50 gauge metric wire would be 5 mm in diameter. Note that in AWG the diameter goes up as the gauge goes down, but for metric gauges it is the opposite. Probably because of this confusion, most of the time metric sized wire is specified in millimeters rather than metric gauges.

Load Carrying Capacities (see table below)

The following chart is a guideline of ampacity or copper wire current carrying capacity following the *Handbook of Electronic Tables and Formulas* for American Wire Gauge. As you might guess, the rated ampacities are just a rule of thumb. In careful engineering the voltage drop, insulation temperature limit, thickness, thermal conductivity, and air convection and temperature should all be taken into account. The Maximum Amps for Power Transmission uses the 700 circular mils per amp rule, which is very very conservative. The Maximum Amps for Chassis Wiring is also a conservative rating, but is meant for wiring in air, and not in a bundle. For short lengths of wire, such as is used in battery packs you should trade off the resistance and load with size, weight, and flexibility. NOTE: For installations that need to conform to the National Electrical Code, you must use their guidelines. Contact your local electrician to find out what is legal!

AWG gauge	Conductor Diameter Inches	Conductor Diameter mm	Ohms per 1000 ft.	Ohms per km	Maximum amps for chassis wiring	Maximum amps for power transmission	Maximum frequency for 100% skin depth for solid conductor

							copper
OOOO	0.46	11.684	0.049	0.16072	380	302	125 Hz
OOO	0.4096	10.40384	0.0618	0.202704	328	239	160 Hz
OO	0.3648	9.26592	0.0779	0.255512	283	190	200 Hz
0	0.3249	8.25246	0.0983	0.322424	245	150	250 Hz
1	0.2893	7.34822	0.1239	0.406392	211	119	325 Hz
2	0.2576	6.54304	0.1563	0.512664	181	94	410 Hz
3	0.2294	5.82676	0.197	0.64616	158	75	500 Hz
4	0.2043	5.18922	0.2485	0.81508	135	60	650 Hz
5	0.1819	4.62026	0.3133	1.027624	118	47	810 Hz
6	0.162	4.1148	0.3951	1.295928	101	37	1100 Hz
7	0.1443	3.66522	0.4982	1.634096	89	30	1300 Hz
8	0.1285	3.2639	0.6282	2.060496	73	24	1650 Hz
9	0.1144	2.90576	0.7921	2.598088	64	19	2050 Hz
10	0.1019	2.58826	0.9989	3.276392	55	15	2600 Hz
11	0.0907	2.30378	1.26	4.1328	47	12	3200 Hz
12	0.0808	2.05232	1.588	5.20864	41	9.3	4150 Hz
13	0.072	1.8288	2.003	6.56984	35	7.4	5300 Hz
14	0.0641	1.62814	2.525	8.282	32	5.9	6700 Hz
15	0.0571	1.45034	3.184	10.44352	28	4.7	8250 Hz
16	0.0508	1.29032	4.016	13.17248	22	3.7	11 k Hz
17	0.0453	1.15062	5.064	16.60992	19	2.9	13 k Hz
18	0.0403	1.02362	6.385	20.9428	16	2.3	17 kHz
19	0.0359	0.91186	8.051	26.40728	14	1.8	21 kHz
20	0.032	0.8128	10.15	33.292	11	1.5	27 kHz
21	0.0285	0.7239	12.8	41.984	9	1.2	33 kHz
22	0.0254	0.64516	16.14	52.9392	7	0.92	42 kHz
23	0.0226	0.57404	20.36	66.7808	4.7	0.729	53 kHz
24	0.0201	0.51054	25.67	84.1976	3.5	0.577	68 kHz
25	0.0179	0.45466	32.37	106.1736	2.7	0.457	85 kHz
26	0.0159	0.40386	40.81	133.8568	2.2	0.361	107 kH
27	0.0142	0.36068	51.47	168.8216	1.7	0.288	130 kHz
28	0.0126	0.32004	64.9	212.872	1.4	0.226	170 kHz
29	0.0113	0.28702	81.83	268.4024	1.2	0.182	210 kHz
30	0.01	0.254	103.2	338.496	0.86	0.142	270 kHz
31	0.0089	0.22606	130.1	426.728	0.7	0.113	340 kHz
32	0.008	0.2032	164.1	538.248	0.53	0.091	430 kHz
Metric 2.0	0.00787	0.200	169.39	555.61	0.51	0.088	440 kHz
33	0.0071	0.18034	206.9	678.632	0.43	0.072	540 kHz
Metric 1.8	0.00709	0.180	207.5	680.55	0.43	0.072	540 kHz
34	0.0063	0.16002	260.9	855.752	0.33	0.056	690 kHz

Metric 1.6	0.0063	0.16002	260.9	855.752	0.33	0.056	690 kHz
35	0.0056	0.14224	329	1079.12	0.27	0.044	870 kHz
Metric 1.4	.00551	.140	339	1114	0.26	0.043	900 kHz
36	0.005	0.127	414.8	1360	0.21	0.035	1100 kHz
Metric 1.25	.00492	0.125	428.2	1404	0.20	0.034	1150 kHz
37	0.0045	0.1143	523.1	1715	0.17	0.0289	1350 kHz
Metric 1.12	.00441	0.112	533.8	1750	0.163	0.0277	1400 kHz
38	0.004	0.1016	659.6	2163	0.13	0.0228	1750 kHz
Metric 1	.00394	0.1000	670.2	2198	0.126	0.0225	1750 kHz
39	0.0035	0.0889	831.8	2728	0.11	0.0175	2250 kHz
40	0.0031	0.07874	1049	3440	0.09	0.0137	2900 kHz

Voltage Drop Calculator by Gerald Newton http://www.electrician2.com

The following calculator calculates the voltage drop, and voltage at the end of the wire for American Wire Gauge from 4/0 AWG to 30 AWG, aluminum or copper wire. (Note: It just calculates the voltage drop, consult the above table for rules-of-thumb, or your local or national electrical code or your electrician to decide what is legal!) Note that the voltage drop does not depend on the input voltage, just on the resistance of the wire and the load in amps.

Select Copper or Aluminum Copper

Select American Wire Gauge (AWG) Size
18 AWG

Select Voltage
120 Volts 1-phase

Enter 1-way circuit
length in feet (the calculation is for the round trip distance)

Enter Load
in amps

Click to Calculate

Voltage drop

Voltage at load end of circuit

Per Cent voltage drop

Wire cross section in circular mils

This chart of American Wire Gauge (AWG) wire sizes and rated ampacities is data intended for the pleasure of our readers only. Typographical errors, etc. are probable, since the typist is not a professional (our CEO). Please point out errors. The data listed are incomplete and should be used as a guideline only. Please contact manufacturers for the latest data.

We hope that this information is helpful. Now go out and design something that needs a charger, power supply, or battery pack!

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Map & Directions

AWG Wire current tables. Also electronic wire gauge for current capacities. Gauge load amp wire chart. Wir Wire gauge chart. Wire gauge charts. Wire gauge capacity. Guage sizes. Wire gage amp rating. Standard wire capacity of copper wire. Wire gauge current. Electrical wire size amps. Electric wire size chart. Wire size amp capacity. Wire gage amp rating. Wire size amp rating. Wire size charts. Wire gage amp size. American Wire G