Glossary of Terms

Appendix B: Wire Gauge & Material Tables

Complete reference tables for wire properties used in VIC choke design. All values at 20°C (68°F) unless noted.

AWG Wire Gauge Reference

AWG	Diameter (mm)	Diameter (in)	Area (mm²)	Area (kcmil)	Cu Ω/1000ft	Cu Ω/km
10	2.588	0.1019	5.261	10.38	0.9989	3.277
12	2.053	0.0808	3.309	6.530	1.588	5.211
14	1.628	0.0641	2.081	4.107	2.525	8.286
16	1.291	0.0508	1.309	2.583	4.016	13.17
18	1.024	0.0403	0.823	1.624	6.385	20.95
20	**0.812**	**0.0320**	**0.518**	**1.022**	**10.15**	**33.31**
22	0.644	0.0253	0.326	0.642	16.14	52.96
24	**0.511**	**0.0201**	**0.205**	**0.404**	**25.67**	**84.22**
26	0.405	0.0159	0.129	0.254	40.81	133.9
28	**0.321**	**0.0126**	**0.081**	**0.160**	**64.90**	**212.9**
30	0.255	0.0100	0.051	0.101	103.2	338.6
32	0.202	0.0080	0.032	0.063	164.1	538.3
34	0.160	0.0063	0.020	0.040	260.9	856.0
36	0.127	0.0050	0.013	0.025	414.8	1361

AWG	Diameter (mm)	Diameter (in)	Area (mm²)	Area (kcmil)	Cu Ω/1000ft	Cu Ω/km
38	0.101	0.0040	0.008	0.016	659.6	2164
40	0.080	0.0031	0.005	0.010	1049	3441

Highlighted rows indicate commonly used gauges for VIC chokes.

Wire Material Resistivity

Material	Resistivity ρ (Ω·m)	Relative to Cu	Temp Coefficient α (/°C)
Silver (Ag)	1.59×10^{-8}	0.95×	0.0038
Copper (Cu)	1.68×10^{-8}	1.00× (reference)	0.00393
Gold (Au)	2.44×10^{-8}	1.45×	0.0034
Aluminum (Al)	2.65×10^{-8}	1.58×	0.00429
Brass	$6\text{-}9 \times 10^{-8}$	4-5×	0.002
Steel	1.0×10^{-7}	6×	0.005
Stainless Steel	6.9×10^{-7}	41×	0.001
Nichrome	1.1×10^{-6}	65×	0.0004

Temperature Correction

Resistance at Temperature T:

`R(T) = R?? × [1 + ?(T - 20)]`

Example (Copper wire):

> - R_{20} = 10 Ω at 20°C
> - At 50°C: R = 10 × [1 + 0.00393(50-20)] = 10 × 1.118 = 11.18 Ω
> - At 80°C: R = 10 × [1 + 0.00393(80-20)] = 10 × 1.236 = 12.36 Ω

Magnet Wire Specifications

Magnet wire has enamel insulation. Overall diameter includes insulation:

AWG	Bare Dia. (mm)	Overall Dia. (mm)	Turns/cm	Turns/inch
18	1.024	1.09	9.2	23.3
20	0.812	0.87	11.5	29.2
22	0.644	0.70	14.3	36.3
24	0.511	0.56	17.9	45.4
26	0.405	0.45	22.2	56.4
28	0.321	0.36	27.8	70.6
30	0.255	0.29	34.5	87.6
32	0.202	0.24	41.7	106

Current Capacity Guidelines

For chassis wiring (in open air):

AWG	Max Current (A)	AWG	Max Current (A)
10	15	24	1.4
12	9.3	26	0.9
14	5.9	28	0.55
16	3.7	30	0.35
18	2.3	32	0.22
20	1.8	34	0.14

AWG	Max Current (A)	AWG	Max Current (A)
22	2.1	36	0.09

For coils, derate by 50% due to limited cooling. Magnet wire rated for higher temperature can handle more current.

Skin Depth Reference

At high frequencies, current flows near the wire surface. Skin depth δ:

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? = ?(? / ?f????)
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Skin Depth in Copper:

Frequency	Skin Depth (mm)	Max Useful Wire Dia.
1 kHz	2.1 mm	~4 mm (AWG 6)
10 kHz	0.66 mm	~1.3 mm (AWG 16)
50 kHz	0.30 mm	~0.6 mm (AWG 22)
100 kHz	0.21 mm	~0.4 mm (AWG 26)

Use wire diameter ≤ 2×δ for effective use of conductor cross-section. For larger currents at high frequencies, use Litz wire.

Quick Reference: DCR Calculation

For Copper Wire:

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DCR (?) = Length (m) × Resistance (?/km) / 1000
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$$\text{DCR } (?) = \text{Length (ft)} \times \text{Resistance } (?/1000\text{ft}) / 1000$$

For Other Materials:

$$\text{DCR}_{material} = \text{DCR}_{Cu} \times (?_{material}/?_{Cu})$$

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