ELECTRICAL · CHEAT SHEET

AWG wire gauge *chart*.

Diameter, area, resistance, and ampacity for every common AWG size — from **4/0** down to **30**. Sourced from ASTM B258 (geometry) and NEC Table 310.16 (ampacity).

The chart

AWG	DIAMETER		AREA		RESISTANCE Ω / 1000 ft @ 20 °C	AMPACITY (NEC, Cu, 30 °C amb.)		
	IN	MM	MM²	KCMIL		60 °C	75 °C	90 °C
4/0	0.46	11.68	107.2	211.6	0.04901	195	230	260
3/0	0.4096	10.4	85.03	167.8	0.0618	165	200	225
2/0	0.3648	9.266	67.43	133.1	0.07793	145	175	195
1/0	0.3249	8.251	53.48	105.5	0.09827	125	150	170
1	0.2893	7.348	42.41	83.69	0.1239	110	130	145
2	0.2576	6.544	33.63	66.37	0.1563	95	115	130
3	0.2294	5.827	26.67	52.63	0.197	85	100	115
4	0.2043	5.189	21.15	41.74	0.2485	70	85	95
5	0.1819	4.621	16.77	33.1	0.3133	—	—	—
6	0.162	4.115	13.3	26.25	0.3951	55	65	75

AWG	DIAMETER		AREA		RESISTANCE Ω / 1000 ft @ 20 °C	AMPACITY (NEC, Cu, 30 °C amb.)		
	IN	MM	MM²	KCMIL		60 °C	75 °C	90 °C
7	0.1443	3.665	10.55	20.82	0.4982	—	—	—
8	0.1285	3.264	8.366	16.51	0.6282	40	50	55
9	0.1144	2.906	6.634	13.09	0.7921	—	—	—
10	0.1019	2.588	5.261	10.38	0.9988	30	35	40
11	0.09074	2.305	4.172	8.234	1.26	—	—	—
12	0.08081	2.053	3.309	6.53	1.588	20	25	30
13	0.07196	1.828	2.624	5.178	2.003	—	—	—
14	0.06408	1.628	2.081	4.107	2.525	15	20	25
16	0.05082	1.291	1.309	2.583	4.015	—	—	—
18	0.0403	1.024	0.823	1.624	6.385	—	—	—
20	0.03196	0.8118	0.5176	1.022	10.15	—	—	—
22	0.02535	0.6438	0.3255	0.6424	16.14	—	—	—
24	0.0201	0.5106	0.2047	0.404	25.67	—	—	—
26	0.01594	0.4049	0.1288	0.2541	40.81	—	—	—
28	0.01264	0.3211	0.08098	0.1598	64.9	—	—	—
30	0.01003	0.2546	0.05093	0.1005	103.2	—	—	—

> **Ampacity notes.** Values are for copper conductors, not more than three current-carrying conductors in a raceway, at 30 °C ambient. The temperature column refers to the conductor insulation rating (TW = 60 °C, THW/RHW = 75 °C, THHN/XHHW = 90 °C). Derating factors apply for higher ambient temperatures or more conductors — see NEC §310.15(B). **Aluminum is different;** reduce by roughly one column (e.g., 10 AWG Al ampacity ≈ 12 AWG Cu).

Common applications

Practical wire gauges by use case. These are typical residential / light-commercial pairings, not a substitute for the NEC or your local code.

USE CASE	TYPICAL AWG	WHY
Lamp / fixture wiring	18, 16	Low current (under 10 A), flexibility matters
Doorbells, thermostats	18, 20	Class 2 signaling, very low current
15 A receptacles, lighting	14	Minimum for 15 A breaker per NEC
20 A kitchen / bath circuits	12	Minimum for 20 A breaker per NEC
Electric dryer (30 A)	10	30 A circuit @ 240 V
Electric range (40–50 A)	8, 6	Sized to breaker; 6 AWG common for 50 A
Subpanel feed (100 A)	3, 2	2 AWG Cu @ 75 °C insulation
Main service entrance (200 A)	2/0, 3/0	2/0 AWG Cu or 4/0 Al per NEC 310.12
USB cable (data)	28	USB 2.0 spec; thicker pairs (24) for power

USE CASE	TYPICAL AWG	WHY
Speaker wire (typical run)	16, 14	14 AWG for runs over 50 ft to keep loss low

Common pitfalls

- **Smaller number = bigger wire.** 4/0 AWG is huge; 30 AWG is hair-thin. This trips up everyone the first time.
- **AWG is not the same as metric gauge.** Some old British and Asian wires use SWG (Standard Wire Gauge) which uses similar numbers but slightly different diameters. Don't substitute without checking.
- **Stranded vs solid:** a 12 AWG stranded conductor has a slightly smaller copper area than 12 AWG solid (typically about 5% less). The published AWG number refers to the total conductor cross-section.
- **The ampacity column matters.** The same 12 AWG wire can carry 20 A (with TW insulation) or 30 A (with THHN). Reading the column is the difference between a working circuit and a fire.
- **Voltage drop, not ampacity, often governs long runs.** For runs over 50 ft, size up for voltage drop even if ampacity allows the smaller wire. See the sizing calculator.

Common questions

Why does smaller AWG mean thicker wire?

AWG was originally based on the number of times a wire was drawn through progressively smaller dies — each pass made the wire thinner. So a 30-gauge wire was drawn 30 times (very thin), while 1-gauge was drawn only once (very thick). The number counts process steps, not size.

How do I size a wire for a 50-amp circuit?

Per NEC Table 310.16, 6 AWG copper at 75°C is rated 65 A and is the standard for a 50-amp circuit (NEC 80% derating rule: 65 × 0.8 = 52 A continuous). For aluminum, you'd step up to 4 AWG. Always check the specific code edition, the temperature rating of your terminals (60°C, 75°C, or 90°C), and the run length for voltage drop on long runs.

Is 12 AWG enough for 20 amps?

Yes, by NEC. 12 AWG copper has a 25 A ampacity at 60°C terminations and 30 A at 75°C, so a 20 A breaker is well within limit. The 80% continuous-load rule means it's actually rated for 24 A continuous at 60°C — comfortably above 20 A. Just confirm your terminations match the wire's temperature class.

What's the voltage drop on a 100-foot 12 AWG run?

For a 20 A load on 120 V at 100 ft round-trip (so 50 ft each way), 12 AWG copper has about 0.16 Ω resistance for the round trip. Voltage drop = 20 A × 0.16 Ω = 3.2 V, or 2.7%. NEC recommends keeping branch-circuit drop under 3%, so 12 AWG at 100 ft is right at the edge — bump to 10 AWG for longer runs or higher loads.

Can I run 14 AWG on a 20-amp breaker?

No. NEC requires 14 AWG to be on a maximum 15 A breaker, 12 AWG on max 20 A, and 10 AWG on max 30 A. The breaker protects the wire — if the breaker is rated higher than the wire ampacity, an overload won't trip the breaker before the wire heats. This is a fire hazard and a code violation.

Sources

- **Geometry (diameter, area):** ASTM B258 — Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors. Diameters computed from the formula d(n) = 0.005 × 92^((36−n)/39) inches.
- **Resistance:** Based on resistivity of annealed copper (1.7241 × 10^{-8} Ω·m at 20 °C, IEC 60228). Values given are for solid copper; stranded conductors are typically 2–4% higher.
- **Ampacity:** NFPA 70 (National Electrical Code), Table 310.16 — Allowable Ampacities of Insulated Conductors Rated Up to and Including 2000 Volts. Values apply to copper conductors, not more than three current-carrying conductors in a raceway, at 30 °C ambient.