

Amp to Wire Size Chart

NEC Table 310.16 and CEC Table 2 reference for copper and aluminum conductors at 30°C (86°F) ambient

Copper Wire Ampacity (NEC 310.16)

Wire Size	60°C (TW, UF)	75°C (THW, THWN, XHHW)	90°C (THHN, THWN-2, XHHW-2)
14 AWG	15 A	20 A	25 A
12 AWG	20 A	25 A	30 A
10 AWG	30 A	35 A	40 A
8 AWG	40 A	50 A	55 A
6 AWG	55 A	65 A	75 A
4 AWG	70 A	85 A	95 A
3 AWG	85 A	100 A	115 A
2 AWG	95 A	115 A	130 A
1 AWG	110 A	130 A	145 A
1/0 AWG	125 A	150 A	170 A
2/0 AWG	145 A	175 A	195 A
3/0 AWG	165 A	200 A	225 A
4/0 AWG	195 A	230 A	260 A
250 kcmil	215 A	255 A	290 A
300 kcmil	240 A	285 A	320 A
350 kcmil	260 A	310 A	350 A
400 kcmil	280 A	335 A	380 A
500 kcmil	320 A	380 A	430 A
600 kcmil	350 A	420 A	475 A
750 kcmil	400 A	475 A	535 A

Which column applies? Per NEC 110.14(C): circuits 100A or less use the **60°C column** unless every termination is marked 75°C. Circuits over 100A use the **75°C column**. The 90°C column is only for derating math, never as-installed ampacity.

Small conductor rule (NEC 240.4(D)): Regardless of insulation type, the breaker cannot exceed **15A on 14 AWG, 20A on 12 AWG, 30A on 10 AWG** copper.

Copper vs Aluminum Quick Reference (75°C Column)

Amperage	Copper	Aluminum
30 A	10 AWG	8 AWG
50 A	8 AWG	6 AWG
100 A	3 AWG	1 AWG
125 A	1 AWG	2/0 AWG
150 A	1/0 AWG	3/0 AWG
200 A	3/0 AWG	4/0 AWG
400 A	500 kcmil	750 kcmil

Common 240V Loads

240V Load	Typical Amps	Wire Size (Copper)
Window A/C	15 A	14 AWG
Baseboard heater (small)	20 A	12 AWG
Electric dryer	30 A	10 AWG
Electric range (small)	40 A	8 AWG
Electric range (full)	50 A	8 AWG (THHN) or 6 AWG (NM)
Hot tub	50-60 A	6 AWG
Level 2 EV charger (40A continuous)	50 A breaker	6 AWG
Level 2 EV charger (48A continuous)	60 A breaker	6 AWG
Welder	50-60 A	6 AWG
Sub-panel (100A)	100 A	3 AWG Cu or 1 AWG Al

Continuous loads (running 3+ hours, like EV chargers) must be sized at 125% per NEC 210.19. That is why a 40A continuous EV charger needs a 50A breaker.

12V DC Wire Size Chart (Short Runs Under 10 ft Round Trip)

Amps	Wire Size	Amps	Wire Size
5 A	16 AWG	50 A	6 AWG
10 A	14 AWG	75 A	4 AWG
15 A	12 AWG	100 A	2 AWG
20 A	10 AWG	150 A	1/0 AWG
30 A	10 AWG	200 A	2/0 AWG
40 A	8 AWG		

For longer 12V runs, go up one gauge for every doubling of distance.

Calculation Formulas

Voltage Drop (Single-Phase or DC):

$$VD = (2 \times K \times L \times I) / CM$$

K = 12.9 for copper, 21.2 for aluminum. L = one-way length (ft). I = current (amps). CM = circular mils of conductor. Target: under 3% VD for branch circuits, 5% combined for branch + feeder. For 3-phase, replace 2 with 1.732.

Convert kW to Amps:

$$\text{Amps} = \text{Watts} / (\text{Volts} \times \text{Power Factor})$$

Power factor: 1.0 for resistive loads (heaters, ovens), 0.8 to 0.95 for motors. Example: 10 kW range at 240V = 10000 / 240 = 41.7 A, requires 8 AWG copper.

Quick Rules of Thumb

Rule	Detail
Long runs	Bump up one wire size per additional 100 ft beyond 100 ft
Continuous loads	Size conductor and breaker at 125% of the continuous load
More than 3 conductors in raceway	Apply derating: 80% (4-6), 70% (7-9), 50% (10-20)
Ambient temp above 30°C	Apply correction factor from NEC 310.15(B)(1)
NM cable (Romex / NMD90)	Always use the 60°C column for ampacity
Aluminum lugs	Use CU/AL or AL/CU rated terminals + antioxidant paste
Canadian 200A residential service	2/0 AWG copper permitted under CEC Table 2 note

Critical Code References

Code Reference	What It Covers
NEC 110.14(C)	Termination temperature limits (60°C, 75°C, 90°C column rules)
NEC 210.19	125% sizing requirement for continuous loads
NEC 240.4(D)	Small conductor breaker limits (15A/14, 20A/12, 30A/10)
NEC 310.16	Main ampacity table for conductors in raceway or cable
NEC 310.15(B)(1)	Ambient temperature correction factors
NEC 310.15(C)(1)	Adjustment factors for more than 3 conductors in raceway
NEC 334.80	NM cable ampacity (use 60°C column)
CEC Table 2	Canadian equivalent of NEC 310.16 for copper conductors
CEC Rule 4-002	Minimum conductor size (14 AWG Cu / 12 AWG Al)
CEC Rule 8-200	Residential service load calculation

Standard Wire Color Codes

Conductor	120/240V Single Phase	208V / 480V 3-Phase (US)	Canada (CEC)
Phase A (Hot)	Black	Black (208V) / Brown (480V)	Red
Phase B (Hot)	Red	Red (208V) / Orange (480V)	Black
Phase C (Hot)	n/a	Blue (208V) / Yellow (480V)	Blue
Neutral	White	White or Grey	White
Ground	Green or bare	Green or Green/Yellow	Green or bare

Codes shown are general practice. Always confirm with the local AHJ. The CEC requires red for Phase A in residential single-phase, which is the opposite of common US wiring practice.

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