

Rack Power Planning Reference

The formulas, the 80% rule, and why nameplate watts lie

$$A = W \div V$$

amps from watts and volts

80%

continuous-load limit: a 30A circuit carries at most 24A continuously

0.95–0.99

power factor of modern PFC server supplies (kW = kVA × PF)

Circuit capacity formulas

Formula	Example
Single-phase kVA = volts × amps ÷ 1000	230 V × 32 A = 7.36 kVA
Three-phase kVA = volts × amps × $\sqrt{3}$ (1.732) ÷ 1000	400 V × 32 A × 1.732 = 22.2 kVA
kW = kVA × power factor	7.36 kVA × 0.95 ≈ 6.99 kW
Derate to 80% for continuous load	6.99 kW → 5.59 kW planable

Typical real-world draws

- A typical 1U/2U server draws 150–400 W under normal load
- Dense GPU servers can draw 2–10 kW each
- PSU nameplate ratings can overstate real draw by 2–3× — racks planned on nameplate run half-empty
- Measured draw from the BMC and per-outlet PDU data beats estimates

A/B redundant power

With dual A/B feeds, each feed must carry the entire rack alone. Usable capacity is one feed's worth, not the two added together: two 32 A feeds give you one 32 A feed of load, with the second as spare. Sizing to the installed total is how a rack that looks fine trips the moment a feed drops.