

Ground Symbol Cheat Sheet

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IEC 60417 · IEEE 315 / ANSI Y32.2 · IEC 60204-1

1 The Six Ground Symbols

 EARTH GROUND IEC 60417-5017 · IEEE 315 3.9.1 Connects to: earth, or a structure serving that role.	 PROTECTIVE EARTH IEC 60417-5019 · IEEE 315 3.9.1.2 Connects to: the conductor carrying fault current.	 FUNCTIONAL EARTH IEC 60417-5018 · IEEE 315 3.9.1.1 Connects to: a dedicated low-noise earth system.
 CHASSIS / FRAME IEC 60417-5020 · IEEE 315 3.9.2 Connects to: the metal chassis, frame or enclosure.	 SIGNAL / COMMON IEEE 315 clause 3.9.3 Connects to: the circuit's own 0 V return node. Solid or hollow, same meaning.	 NAMED RETURNS IEEE 315 3.9.3 lettering Connects to: one named 0 V return among several.

Colour key: ■ Earth family ■ Chassis ■ Circuit common ■ Named returns

2 Which One, and When

Symbol	Name	Use it when	Do not use it for
	Earth, general 5017 · 3.9.1	Neither the protective nor the functional earth symbol is specified	A circuit's 0 V return
	Protective earth 5019 · 3.9.1.2	The terminal takes the conductor that protects against shock in a fault	Any purely functional or signal connection
	Functional earth 5018 · 3.9.1.1	The earth exists to keep the equipment working, not to protect people	Protective bonding, ever
	Chassis or frame 5020 · 3.9.2	The node is the metalwork: body, shield can, rack, airframe	Claiming the node sits at earth potential
	Signal / common IEEE 315 3.9.3	Marking the circuit's own return; all like-labelled points are one net	Equipment marking — it is not in IEC 60417
	AGND / DGND / PGND 3.9.3 lettering	Several returns exist and each needs naming; label goes <i>inside</i> the triangle	Inventing a new shape — only the name changes

Marking a PE terminal (IEC 60204-1, clause 8.2.6): the graphic symbol 5019, the letters PE, or green-and-yellow bicolour are all accepted — and the standard states the graphical symbol is preferred.

3 In Your EDA Tool — the Name Sets the Net, Not the Picture

Tool	Where the symbols live	Names you get	What sets the net
KiCad	The power symbol library	GND, GNDA, GNDD, GNDPWR, GNDREF, GNDS, Earth, Earth_Clean, Earth_Protective	The power symbol's own name, which acts as a global label
Altium Designer	Place → Power Port → pick a style	Signal Ground, Power Ground, Earth, Bar, Arrow, Wave	The Net Name field, <i>not</i> the style
EasyEDA	Wiring Tools → NetFlag; Ctrl+G places GND	GND, Analog GND, Digital GND, VCC	The NetFlag name; renaming it creates a different net

To create a genuinely separate return: 1. Place the symbol and name it, e.g. AGND. 2. Reuse that exact name on every sheet. 3. Join it to GND at *one* point only, via a 0 Ω link or a net tie. 4. Run ERC and confirm two nets joined once — not one merged net.

4 Six Ways People Get It Wrong



Letting the stem touch the circle. In IEC 60417-5019 the stem stops *inside* the circle and never meets it. The 2011 NFPA 70 (US NEC) informational-note figure drew it touching; the standard does not.



Drawing three bars the same width. 5017's bars must shrink as they descend, all centred on the stem, which meets the top bar only. Equal bars are not the standard symbol.

- **Two bars plus a rake.** The chassis symbol 5020 has *one* bar. If you drew a second one, you drew a hybrid that means nothing.
- **Reading a triangle that points up as ground.**  points up, so it is a supply rail. Returns point down.

- **Assuming chassis means earth.** IEEE 315 clause 3.9.2 warns the chassis may sit at substantial potential above the structure it is mounted in. Bond it explicitly or it is not earthed.
- **Trusting the glyph over the label.** Different pictures with the same net name are one net. The same picture with different names is a split ground — make sure that was deliberate.

Symbol → Net → Plane → Stitching via. The glyph declares which ground it is. The net name carries it into the netlist. The layout assigns copper to that net. Vias tie that copper together across layers.