CABLE CALCULATION, STEP 10: R1 + R2

HOW BIG IS THE CPC IN 16 MM² TWIN AND EARTH?

So far we know the circuit works in **normal** use: little voltage drop, Reg 433.1.1 met, the right cable. The second half asks: **will it disconnect in a fault?** Imagine a pan boils over, water gets into the oven and the metal case becomes live. We want **automatic disconnection of supply (ADS)**. That needs a good **protective conductor path** from the cooker case all the way back to the **star point** of the supply transformer (on a TN system).

BS 7671 · Part 2 · Fig 2.1 · illustration of earthing and protective conductor terms · **p.51**

ITS KEY NAMES THE EARTHING CONDUCTOR, THE MAIN EARTHING TERMINAL, THE CIRCUIT PROTECTIVE CONDUCTOR AND THE EXPOSED-CONDUCTIVE-PART

T&E CPC sizes. T&E is one of the few cables with a **smaller CPC**. The standard off-the-shelf sizes are:

LINE (MM²)	1.0	1.5	2.5	4	6	10	16
CPC (MM²)	1.0	1.0	1.5	1.5	2.5	4	6

`R1 + R2 = (Table B1 mΩ/m × Table B3 multiplier × L) ÷ 1000`

- **Table B1** (Guidance Note 3, Appendix B): resistance of line + CPC per metre. **16 mm² line with 6 mm² CPC = 4.23 mΩ/m**.
- **Table B2**: **don't use it for design**. It's for the inspector to correct a test reading from 20 °C to the temperature on the day of testing. It's a test correction, not a design one.
- **Table B3**: corrects the resistance to the conductor's **operating temperature**. Faults happen while circuits are working, and warm copper has more resistance. Skip B3 and you don't know whether it will disconnect **with the oven on**. For 70 °C thermoplastic, use the row "**incorporated in a cable or bunched**" (the one you'll almost always use): **1.2**.

WORKING

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Line 16 mm² · CPC 6 mm² · L = 27 m
R1 + R2 = (4.23 × 1.2 × 27) ÷ 1000
        = 0.137 Ω        (keep the full figure; don't round as you go)
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Guidance Note 3 · Appendix B · Table B1 · R1 + R2 per metre (mΩ/m) · **p.174**

Guidance Note 3 · Table B2 · ambient temperature multipliers (for testing) · **p.175**

Guidance Note 3 · Table B3 · operating-temperature multipliers (1.2) · **p.176**

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