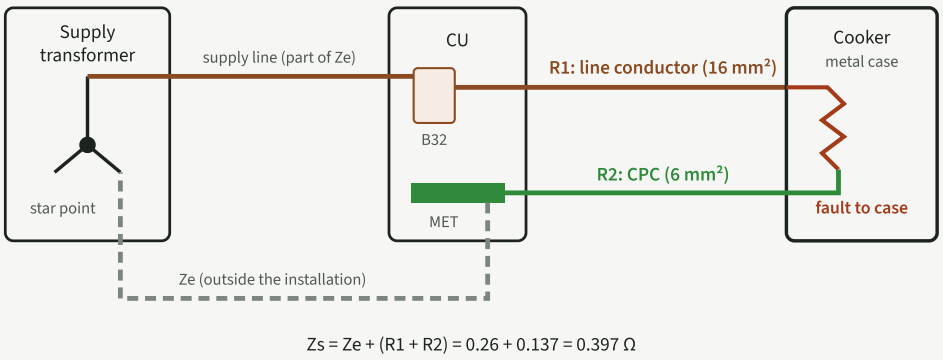
CABLE CALCULATION, STEPS 11 AND 12: ZS AND DISCONNECTION TIME

WILL IT DISCONNECT IN 0.4 SECONDS?

STEP 11: ZS AND THE MAXIMUM ZS

In an earth fault, the current doesn't just go round your 27 m of cable. It goes all the way back to the **star point**. So we add the external part, **Ze**.



Zs = Ze + (R1 + R2) = 0.26 + 0.137 = 0.397 Ω

The earth fault loop. Ze (0.26 Ω, measured, given in the brief) covers everything outside the installation. R1 + R2 is the circuit you're designing.

```
WORKING
Zs = Ze + (R1 + R2)
   = 0.26 + 0.137
   = 0.397 Ω

Table 41.3: max tabulated Zs, 32 A Type B = 1.37 Ω
0.397 Ω ≤ 1.37 Ω ✓  → automatic disconnection of supply will happen
```

> **BS 7671** · Chapter 41 · Table 41.3 · max Zs for circuit-breakers (32 A Type B = 1.37 Ω) · **p.75**

Tabulated (BS 7671) vs measured (OSG / GN3)

- Why not the OSG's 1.09 Ω? Because this is **design**. You want to know the circuit disconnects when it's **working**, at its full operating temperature (70 °C). BS 7671's values are for that.

- The **On-Site Guide Table B6** (and GN3) give **maximum measured** values. They're about **80%** of the tabulated ones, for an inspector testing a cold circuit (around 20 °C). For example, a new circuit is tested on a mild April day. The 20% margin allows for the cable warming up in use.
- Compare them: **32 A Type B** is 1.37 Ω in BS 7671 and 1.09 Ω in the OSG (Table B6). **6 A Type B** is 7.28 Ω in BS 7671, and 80% of that is about **5.82 Ω**. Check your copy.

On-Site Guide · Table B6 · max **measured** Zs (≈ 80% of Table 41.3)

STEP 12: DISCONNECTION TIME (TABLE 41.1)

See **Reg 411.3.2.2**. Table 41.1 is for final circuits. Two kinds of circuit fall outside it and are allowed longer:

- **distribution circuits** (feeding another board, e.g. a garage, shed or another building), and
- final circuits **above 32 A** feeding only fixed equipment, or **above 63 A** with socket-outlets.

Those get **5 s** on TN (or **1 s** on TT). Our circuit is a **32 A** final circuit with a socket, so we use **Table 41.1**.

- Choose the voltage band from **U_0**, the voltage **to earth**: **over 120 V up to 230 V**. That's the most commonly used column. Even on **three-phase**, U_0 is still 230 V, so don't jump to the 400 V column.
- AC, TN system → **0.4 s** maximum.

> **The shortcut**If the actual Zs is below the maximum tabulated Zs, the device **will** disconnect in time. That's what the Table 41.3 values are built from.

BS 7671 · Reg 411.3.2.2 and Table 41.1 · maximum disconnection times · **p.71** (table at the top of p.72)

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