EARTH CONTINUITY, AND WORKING OUT THE EXPECTED RESISTANCE

WHAT'S THE MOST AN EXTENSION LEAD CAN READ?

EARTH CONTINUITY

? **Continuity** asks: is the protective conductor unbroken from the earth pin of the plug all the way to the accessible metal part? You want a **complete path with very low resistance**.

✋ **Class I only.** A class II appliance has no earth, so there is no continuity test to do — a dedicated PAT tester set to class II won't even offer it. Extension leads get their own treatment, because class I equipment can be plugged into them.

The limits, from Section 10:

EQUIPMENT	MAXIMUM
No supply cable	0.1 Ω
With a supply cable (including extension leads and trailing sockets)	0.1 Ω + R of the cable
3-core lead sets and extension leads	0.1 Ω + R
Multiway adaptors and RCD adaptors	0.1 Ω

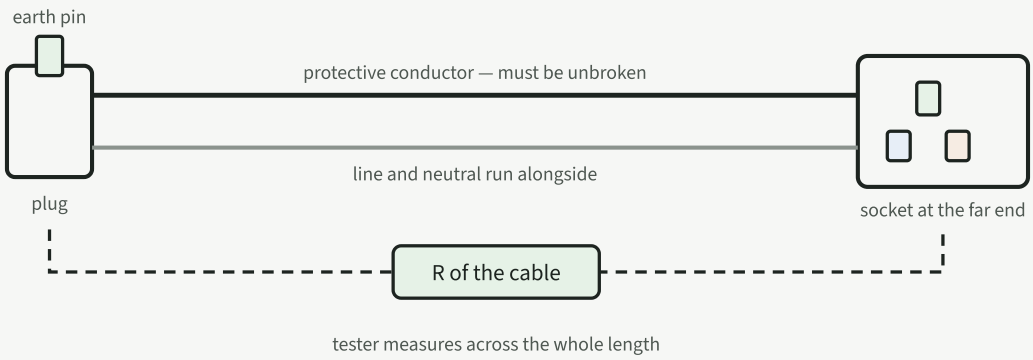
"Supply cable"
means the lead from the plug to the appliance — the bit you'd coil up to carry it.

In practice you put one probe on an **exposed-conductive-part** — the metalwork itself, not the protective conductor connection point such as the earth screw head. On a class I kettle that's the element housing; on a hot plate, the metal casing or trim. Where there are several, test each. Only exposed-conductive-parts need testing.

Flex the cable while you watch the reading.
A value that jumps or climbs points to a poor connection. Painted or powder-coated parts can read high — repeat the test to get a better contact (10.5.2, Table 10.1 notes).

Section 10 · 10.5.2 · protective conductor continuity

Table 10.1 · the 0.1 Ω rule



Class I only. An extension lead is tested end to end — earth pin of the plug to the earth contact of the socket — so the reading includes the resistance of the whole cable.

WORKING OUT THE EXPECTED RESISTANCE

This is the one calculation in the module, and it's worth having cold.

R = (mΩ/m × length) ÷ 1000

Divide by 1000 because the table is in **milliohms** per metre — exactly like volt drop and mV/A/m

The mΩ/m figure for the cable is given in the question. The worked examples here use these figures:

CSA	MΩ/M
1.25 mm²	15.6
2.5 mm²	8
4 mm²	5
16 mm²	1.2

A 12 M EXTENSION LEAD IN 1.25 MM²

R = (15.6 × 12) ÷ 1000
R = 187.2 ÷ 1000
R = 0.187 Ω

Maximum permitted = 0.1 + 0.187 = **0.287 Ω**

So your measured result should fall between **0.187 Ω and 0.287 Ω**

TWO MORE, WORKED THE SAME WAY

15 m of 4 mm²
R = (5 × 15) ÷ 1000 = 0.075 Ω
Maximum = 0.075 + 0.1 = **0.175 Ω**

75 m of 16 mm²
R = (1.2 × 75) ÷ 1000 = 0.09 Ω
Maximum = 0.09 + 0.1 = **0.19 Ω**

You work it out for one conductor, not two.
Where a flex is marked "2 × 0.5", that means line and neutral are each 0.5 mm² — it isn't telling you to double anything. Earth continuity is measured along the **protective conductor only** — earth pin to the metalwork — so R is for that one conductor.

How do you know the CSA on site?
It's printed or embossed on the cable. Also on the drum label and the wrapping.

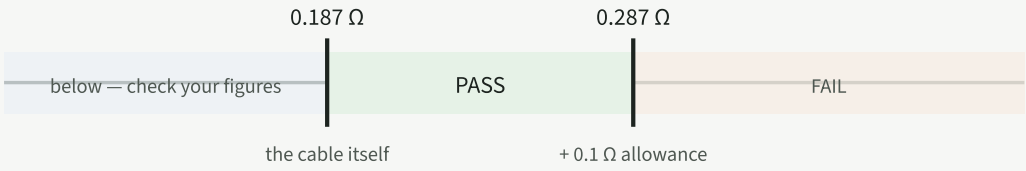
Extension leads have a maximum length too.
Table 10.3 (p.75): **12 m** in 1.25 mm², **15 m** in 1.5 mm². On a lead, polarity is checked by continuity as well (10.10(d), p.75).

Section 10 · Table 10.1 · **p.71** · add 0.1 Ω

Table 10.3 · extension lead lengths · **p.75**

12 m extension lead, 1.25 mm² — 15.6 mΩ/m

R = (15.6 × 12) ÷ 1000 = 0.187 Ω · maximum = 0.1 + 0.187 = 0.287 Ω



A reading under 0.187 Ω cannot be right for this cable — recheck the length, the CSA, or whether the leads were nulled.

The answer is a band, not a single number: at or above the cable's own resistance, and no more than 0.1 Ω above it.

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