RING FINAL CIRCUITS: THE THREE-STEP TEST

WHY DIVIDE BY FOUR?

RING FINAL CIRCUITS: WHY THEY GET THEIR OWN TEST

Guidance Note 3 · 2.6.6 · pp.63–68, and **On-Site Guide** · pp.127, 129. A ring is the one circuit with its own continuity procedure, in **three steps**.

STEP	WHAT YOU DO	WHAT IT PROVES
1	End to end on each conductor separately	r_1, r_n and r_2
2	Cross-connect line and neutral — the figure of eight	$R_1 + R_n$ at every outlet
3	Cross-connect line and cpc	$R_1 + R_2$ at every outlet

Why it is separate.
Imagine having to do all of this for a bonding conductor or a radial. The ring needs it because the two legs are in parallel with each other, and nothing else is.

Ring length.
A ring final circuit has a maximum length, and it depends on the supply and the protective device. Too long and you stop satisfying the loop impedance requirement.

STEP 1: END TO END

Three separate tests, moving your two leads onto each conductor in turn. Both leads on **one** conductor, so each is an **r_2-type test** — the same method as a bonding conductor.

WORKED EXAMPLE: A RING IN 4 MM²/1.5 MM² TWIN AND EARTH, 15 M

Measured r_1 (line) = **0.07 Ω**

r_n (neutral) = **0.07 Ω**
Why the same? Line and neutral are the **same csa** and the **same length**, in the same cable.

r_2 (cpc) = r_1 × (line csa ÷ cpc csa)
= 0.07 × (4 ÷ 1.5)
= 0.07 × **2.67**
= **0.19 Ω**

What the ratio is telling you.
The cpc has a smaller area than the line, so its resistance is 2.67 times higher. Put the other way round, r_1 is 2.67 times lower than r_2.

The other ring size.
For 2.5 mm²/1.5 mm² the ratio is 2.5 ÷ 1.5 = **1.67**.

STEP 2: THE FIGURE OF EIGHT, LINE TO NEUTRAL

In the consumer unit, cross-connect the two legs: the **line of leg 1 to the neutral of leg 2**, and the line of leg 2 to the neutral of leg 1. Connector blocks do the job.

$$\text{Expected } R_1 + R_n = (r_1 + r_n) \div 4$$

USING THE STEP 1 VALUES

(0.07 + 0.07) ÷ 4
= 0.14 ÷ 4
= 0.035
= **0.04 Ω** on a two-decimal meter

Why divide by four?
With the figure of eight made up, the ring becomes **one loop** of resistance $r_1 + r_n$. Wherever you plug in, you are measuring **two halves of that loop in parallel**: each half is $(r_1 + r_n) \div 2$, and two equal halves in parallel give half of that again — $(r_1 + r_n) \div 4$.

Guidance Note 3

· p.66 shows the parallel network behind it.

> Every outlet on the ring should read the same

You take the reading at each socket with a plug-in test adapter, leads between line and neutral. On a correctly cross-connected ring they all come out the same.

STEP 3: LINE TO CPC

Same cross-connection, but now between **line and cpc**. This is the **$R_1 + R_2$** test method.

> Expected $R_1 + R_2 = (r_1 + r_2) \div 4$

USING THE STEP 1 VALUES

```
(0.07 + 0.19) ÷ 4
  = 0.26 ÷ 4
  = 0.065
  = 0.07 Ω   (a less precise meter may show 0.06)
```

Again, the same reading is expected at **every outlet on the ring**.

> **Note the difference from step 2.**
> Step 2 adds r_1 and r_n, which are equal. Step 3 adds r_1 and r_2, and r_2 is the bigger number — so step 3 always gives the higher reading.

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