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EPISODE 71

ELECTRICAL SAFETY

120 seconds

EN · العربية

PRACTICAL ELECTRICAL KNOWLEDGE

Earthing Systems

TN, TT, IT — the three arrangements behind every distribution board, and why the two letters matter.

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Why three earthing types?

Because how the system connects to earth decides how fast a fault clears, how much touch voltage appears, and which protective device actually trips.

DEFINITION · 1 OF 2

TN-S

Separate **neutral & earth**, all the way.

A dedicated protective-earth (PE) conductor back to the source. Low loop impedance — **overcurrent devices clear the fault.**

DEFINITION · 2 OF 2

TT

A local **earth electrode** at the installation.

Earth via a local rod, not the supply. Loop impedance is high — **an RCD is essential.**

THE RULE

$$Z_s \times I_a \leq U_0$$

Earth-fault loop impedance × disconnection current must stay within the nominal voltage U_0 — that is what makes the device trip in time (0.4 s / 5 s, IEC 60364-4-41).

Three systems. One choice.

Per IEC 60364-3 the arrangement is named by two letters: source-to-earth, then installation-to-earth.

TN-S

Separate N & PE conductors

MCB

clears fault

TT

Local earth electrode

RCD

mandatory

IT

Isolated / high-impedance

1st

fault tolerated

Disconnection times to know.

Max fault clearance for final circuits ≤32 A, per IEC 60364-4-41 (illustrative).

TN · 230 V final circuit	0.4 s
TT · 230 V final circuit	0.2 s
TN · distribution circuit	5 s
TT · distribution circuit	1 s
Touch-voltage limit (AC)	50 V

Trusting the earth rod alone.

On a **TT system** the earth-loop impedance is usually too high for a breaker to clear a fault. Without a correctly rated **RCD**, exposed metalwork can stay live.

NEXT TIME YOU ENERGISE A BOARD

Confirm the earthing arrangement.

Know the letters before you size protection — they decide RCD vs overcurrent, bonding, and test method.

- System type: TN-S / TN-C-S / TT / IT
- Measured Z_s vs maximum permitted
- RCD type & rating where required

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Lightning Protection (IEC 62305)

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