Battery Internal Resistance and Terminal Voltage

Internal resistance of a battery from open-circuit and on-load voltages, and the terminal voltage, loss and short-circuit current at another load.

Method: V = E − I r (Thevenin model)

Input parameters

Unit system: SI

Parameter	Value	Unit
Open-circuit voltage	12.700	V
Terminal voltage on load	12.100	V
Load current for that reading	50.000	A
Another load current	150.00	A

Calculated results

Parameter	Value	Unit
Internal resistance	0.012000	Ω
Terminal voltage at I_2	10.900	V
Internal loss at I_2	0.27000	kW
Prospective short-circuit current E/r	1,058.3	A

Notes for this case

- Internal resistance rises with age, cold and low charge; compare readings over time.

Formula and method

$$r = \frac{E - V_1}{I_1}, \quad V_2 = E - I_2 r, \quad P_r = I_2^2 r, \quad I_{sc} = \frac{E}{r}$$

Variables

E	Open-circuit voltage	V
V_1	Terminal voltage on load	V
I_1	Load current for that reading	A
I_2	Another load current	A
r	Internal resistance	Ω
V_2	Terminal voltage at I_2	V
P_r	Internal loss at I_2	W
I_{sc}	Prospective short-circuit current E/r	A

Method and standards

Thevenin model.

Assumptions and limits

- Linear model.

References

- V = E − I r (Thevenin model)

Report details

Report reference	FCC-0T2H-6JDE (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Battery Internal Resistance and Terminal Voltage
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/batteries-ups/battery-internal-resistance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.