# Battery Capacity Correction for Low Temperature and Ageing

Capacity available at a low temperature by a linear temperature coefficient, and the rated capacity to buy for a load with temperature, ageing and design margins.

**Method:** Linear capacity–temperature relation with sizing margins

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Capacity the load needs (at the rated discharge rate) | 200.00 | Ah |
| Lowest electrolyte temperature | 5.0000 | °C |
| Rating temperature | 25.000 | °C |
| Capacity temperature coefficient | 0.006000 | 1/K |
| Ageing factor | 1.2500 | |
| Design margin | 1.1000 | |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Temperature capacity factor | 88.000 | % |
| Rated capacity required | 312.50 | Ah |
| Overall sizing factor | 1.5625 | |

### Notes for this case

• Available capacity C_T = C_r[1 + λ(T − T_r)] (about 0.6 % per kelvin for lead-acid at long discharge rates, more at high rates). Rated capacity C_r = C_L·k_a·k_d/k_T: ageing factor 1.25 lets the battery reach 80 % capacity before it is replaced. Use the maker's temperature curves where available.

## Formula and method

$$k_T = 1 + \lambda(T - T_r), \quad C_r = \frac{C_L k_a k_d}{k_T}$$

### Variables

| | | |
|---|---|---|
| $C_L$ | Capacity the load needs (at the rated discharge rate) | C |
| $T$ | Lowest electrolyte temperature | K |
| $T_r$ | Rating temperature | K |
| $\lambda$ | Capacity temperature coefficient | 1/K |
| $k_a$ | Ageing factor | - |
| $k_d$ | Design margin | - |
| $k_T$ | Temperature capacity factor | - |
| $C_r$ | Rated capacity required | C |
| $C_r/C_L$ | Overall sizing factor | - |

### Method and standards

Capacity correction.

### Assumptions and limits

- Linear coefficient over the range; rating rate matches the duty.

### References

Linear capacity–temperature relation with sizing margins

## Report details

| | |
|---|---|
| Report reference | FCC-K1FF-RRRE (the same inputs always give the same reference) |
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| Calculator | Battery Capacity Correction for Low Temperature and Ageing |
| Method last reviewed | 17 November 2026 |
| Software release | FireCAD Calc, release of 22 November 2026 |
| Release checks | 3 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-capacity-temperature-correction

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.