# Bomb Calorimeter Gross Calorific Value

Gross calorific value of a solid or liquid fuel from a bomb calorimeter test: water and water equivalent, temperature rise, cooling correction and fuse or acid corrections, with the net value.

**Method:** Bomb calorimeter heat balance (textbook; principle of ISO 1928 and ASTM D5865); Latent heat of water at 25 °C from IAPWS-IF97

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Mass of fuel burnt | 1.0000 | g |
| Mass of water in the calorimeter | 2.0000 | kg |
| Water equivalent of the calorimeter<br>Mass of water with the same heat capacity as the bomb, bucket and stirrer. | 0.50000 | kg |
| Initial temperature | 25.000 | °C |
| Final (highest) temperature | 27.500 | °C |
| Cooling correction<br>Added to the observed rise for heat lost while the temperature was rising. | 0.020000 | K |
| Specific heat of water | 4.1868 | kJ/(kg·K) |
| Fuse wire, thread and acid corrections | 0 | J |
| Hydrogen in the fuel, same basis as the sample (for the net value) | 4.0000 | % |
| Moisture in the sample burnt (for the net value) | 0 | % |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Corrected temperature rise | 2.5200 | K |
| Heat released by the fuel | 26.377 | kJ |
| Gross calorific value | 26,377 | kJ/kg |
| Net calorific value | 25,504 | kJ/kg |

**Notes for this case**

- The bomb gives the gross value at constant volume, on the basis of the sample burnt (often air-dried, not as fired); the net value subtracts the latent heat (at 25 °C) of the water formed from hydrogen and of the moisture.

## Formula and method

$$\Delta T = T_2 - T_1 + T_c$$

$$GCV = \frac{(m_w + m_e)\, c_w\, \Delta T - Q_c}{m_f}$$

$$NCV = GCV - \left( \frac{M_{H_2O}}{M_{H_2}} H + M \right) h_{fg,25}$$

### Variables

| | | |
|---|---|---|
| $m_f$ | Mass of fuel burnt | kg |
| $m_w$ | Mass of water in the calorimeter | kg |
| $m_e$ | Water equivalent of the calorimeter | kg |

| | | |
|---|---|---|
| $T_1$ | Initial temperature | K |
| $T_2$ | Final (highest) temperature | K |
| $T_c$ | Cooling correction | K |
| $c_w$ | Specific heat of water | J/(kg·K) |
| $Q_c$ | Fuse wire, thread and acid corrections | J |
| $H$ | Hydrogen in the fuel (for the net value) | - |
| $M$ | Moisture in the fuel (for the net value) | - |
| $\Delta T$ | Corrected temperature rise | K |
| $Q$ | Heat released by the fuel | J |
| $GCV$ | Gross calorific value | J/kg |
| $NCV$ | Net calorific value | J/kg |

### Method and standards

Heat released by the sample equals the heat taken up by the water and the calorimeter (water equivalent), less the heat from the fuse wire, thread and acid formation.

### Assumptions and limits

- Constant-volume gross value; the small difference from constant-pressure GCV is ignored.
- Corrections entered by the user.
- The net value is a simple latent-heat deduction from the constant-volume gross value. The net value at constant pressure defined in ISO 1928 and ASTM D5865 adds small terms for oxygen and nitrogen, so it differs slightly; use the standard's own procedure for a reported result.
- Hydrogen and moisture must be on the basis of the sample burnt (often air-dried); convert to as fired with the fuel basis conversion calculator.

### References

• Bomb calorimeter heat balance (textbook; principle of ISO 1928 and ASTM D5865)
• Latent heat of water at 25 °C from IAPWS-IF97

## Report details

| | |
|---|---|
| Report reference | FCC-WPXS-B9KE (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:36 UTC |
| Calculator | Bomb Calorimeter Gross Calorific Value |
| Method last reviewed | 12 November 2026 |
| Software release | FireCAD Calc, release of 17 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/boilers-power-plant/combustion/bomb-calorimeter-gcv

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.