Junkers Gas Calorimeter Calorific Value

Gross and net calorific value of a fuel gas from a Junkers (Boys) gas calorimeter: gas burnt, cooling water and its temperature rise, condensate, and gas volume corrected to normal conditions.

Method: Junkers (Boys) gas calorimeter heat balance (textbook); Latent heat of water at 25 °C from IAPWS-IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Gas burnt, by the meter	10.000	L
Gas pressure at the meter (absolute)	1,023.2	mbar
Gas temperature at the meter	15.000	°C
Cooling water collected	6.0000	kg
Water inlet temperature	15.000	°C
Water outlet temperature	30.000	°C
Specific heat of water	4.1868	kJ/(kg·K)
Gas meter	Dry meter (dry gas)	
Steam condensate collected (for the net value)	16.000	g

Calculated results

Parameter	Value	Unit
Heat taken up by the water	376.81	kJ
Gas burnt at 0 °C and 101.325 kPa	9.5730	L
Gross calorific value per m³ at meter conditions	37,681	kJ/m³
Gross calorific value per Nm³	39,362	kJ/Nm³
Net calorific value per Nm³	35,281	kJ/Nm³

Notes for this case

- Dry meter: the meter volume is taken as dry gas. For a wet (water-sealed) meter choose it above; the vapour lowers the dry volume by about 1.7 % at 15 °C.

Formula and method

$$Q = m_w \, c_w \, (T_{out} - T_{in})$$

$$V_N = V_g \, \frac{p_g - p_v}{101.325 \text{ kPa}} \, \frac{273.15 \text{ K}}{T_g}$$

$$GCV = \frac{Q}{V_N}, \quad NCV = GCV - \frac{m_c}{V_N} \, h_{fg,25}$$

Variables

V_g	Gas burnt, by the meter	m³
p_g	Gas pressure at the meter (absolute)	Pa
T_g	Gas temperature at the meter	K
m_w	Cooling water collected	kg
T_{in}	Water inlet temperature	K
T_{out}	Water outlet temperature	K

c_w	Specific heat of water	J/(kg·K)
meter	Gas meter: dry, or wet (water-sealed, gas saturated)	-
p_v	Water vapour pressure at T_g (IF97) for a wet meter; zero for a dry meter	Pa
m_c	Steam condensate collected (for the net value)	kg
Q	Heat taken up by the water	J
V_N	Gas burnt at 0 °C and 101.325 kPa	m³
GCV_m	Gross calorific value per m³ at meter conditions	J/m³
GCV	Gross calorific value per Nm³	J/m³
NCV	Net calorific value per Nm³	J/m³

Method and standards

Heat from the burnt gas equals the heat taken up by the cooling water; the gas volume is corrected to 0 °C and 101.325 kPa by the ideal gas law.

Assumptions and limits

- Dry gas at the meter unless the wet meter is chosen, when the gas is taken as saturated at the meter temperature; no heat loss.
- If the condensate's latent heat exceeds the heat measured, no net value is shown.
- Normal conditions 0 °C, 101.325 kPa.

References

• Junkers (Boys) gas calorimeter heat balance (textbook)
• Latent heat of water at 25 °C from IAPWS-IF97

Report details

Report reference	FCC-TQJ2-YSXA (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Junkers Gas Calorimeter Calorific Value
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	4 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/junkers-gas-calorimeter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.