

USEFUL FACTS ABOUT HYDROGEN, NATURAL GAS (METHANE) AND ELECTRICITY.



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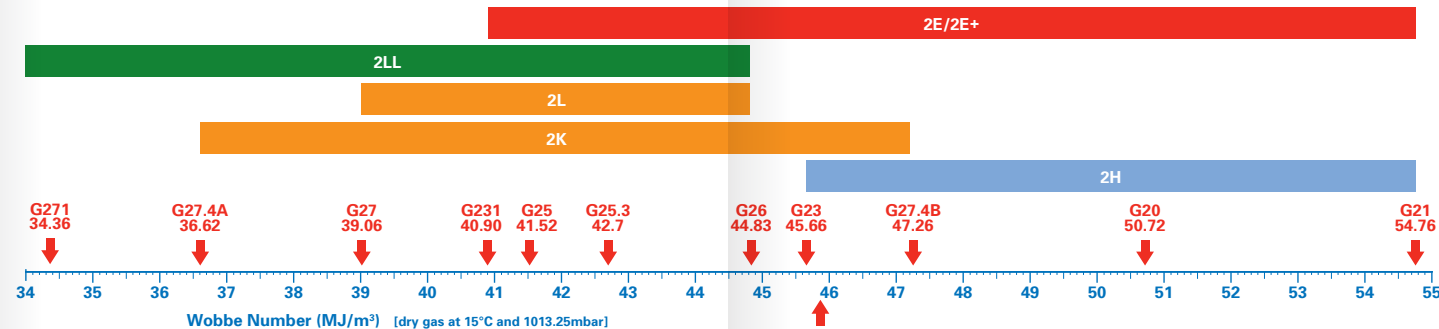
We're here to help...

Kiwa Useful Gas Information Leaflet

Gas quality · Gas dispersion safety · Appliance testing

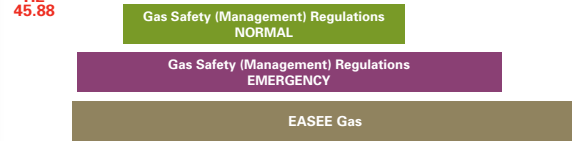


European Gas Categories



Above line: Test gases
 Below line: Supplied gases

- DE
- BE, FR, DE, LU, PL, RO, NL
- NL
- AT, BG, CH, CZ, DK, EE, ES, FI, GB, GR, HR, IE, IT, LT, LV, NO, PT, RO, SE, SI, SK, TR, NL



H2
45.88

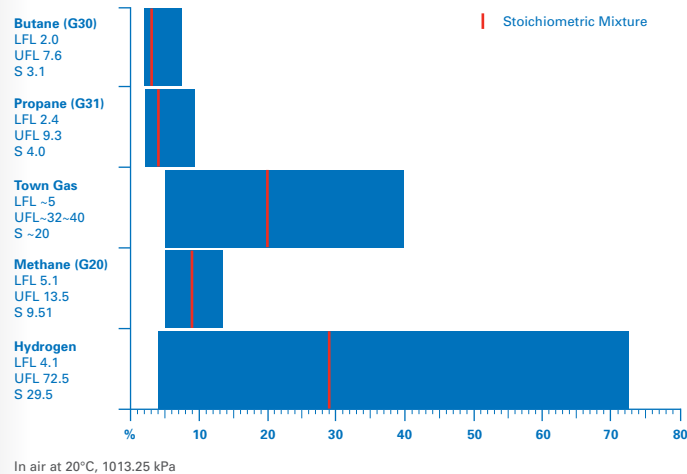
Physical Properties

Property	Unit	Hydrogen	Methane (G20)	Town Gas ²	LPG	
					Propane (G31)	Butane (G30)
Chemical Formula	-	H ₂	CH ₄	~50% H ₂	C ₃ H ₈	C ₄ H ₁₀
Molar Mass (M)	kg/kmol	2.02	16.04	13.22	44.10	58.12
Density (ρ)¹	kg/m ³	0.085	0.680	0.559	1.899	2.543
Relative Density (d)¹	-	0.070	0.555	0.456	1.550	2.075
Gross Calorific Value¹	MJ/m ³	12.10	37.78	16.46	95.65	125.81
	MJ/kg	141.97	55.57	29.43	50.37	49.47
	kWh/m ³	3.36	10.49	4.57	26.57	34.95
Wobbe Index¹	MJ/m ³	45.88	50.72	24.36	76.84	87.33

¹ - 15°C, 1013.25 kPa

² - Typical Town gas analysis – 51.0% H₂, 15.0% CO, 19.0% CH₄, 2.0% C₂H₄, 4.0% CO₂, 7.5% N₂, 1.5% O₂

Fuel Flammability Limits



Carbon Dioxide Emission Factors

Property	Unit	Hydrogen	Methane (G20)	Electricity
Scope 1 (chemical emissions)	kgCO ₂ /kWh (Gross Calorific Value)	.0270	0.184	NA
Scope 1 + 2		.0495	0.184	0.401
Scope 1+2+3		0.0858	0.209	0.447
Carbon Dioxide Equivalent	Ref CO ₂ warming potential	1	21	NA

Scope 1 – Direct emissions at plant

Scope 2 – Emissions released from indirect consumption
(for H₂ included imported power for CO₂ sequestration)

Scope 3 – Emissions generated in the wider economy (inc. imported LNG)

Recent Indicative Gas and Electricity Costs

All data from BEIS sources (except H21 Leeds City Gate study)

Renewables will be site dependent. Renewable electricity costs are at the terminals of the site ie excludes transmission/distribution and any heat pump etc.

£/kWh	Gas	Electricity
Bulk supplies to large industry	£0.020	£0.098
Domestic consumers	£0.048	£0.154
Wind Offshore	NA	£0.08 -£0.21
Wind Onshore	NA	£0.08-£0.11
Solar PV	NA	£0.125-£0.18
Nuclear	NA	£0.095

Hydrogen (ex H21 Leeds City Gate study) Includes TOTAL cost gas well to domestic sofa

- Excluding cost of appliance conversion ~£0.076/kWh
- Including cost of appliance conversion ~£0.093/kWh

