

Hydrogen er: / Hydrogen is:

- ikke eksplosivt / not explosive
- ikke giftig / not toxic
- ikke korrosivt / not corrosive
- ikke selvantennende / not autoigniting
- ikke oksiderende / not oxidizing
- ikke nedbrytbar / not decomposing
- ikke radioaktivt / not radioactive
- heft geen nare geur / geurloos / not badly smelling
- ikke vanntruende / not endangering water
- ikke kreftfremkallende / not causing cancer

Hydrogen er lettere enn luft og stiger raskt oppover.

Hydrogen is lighter than air and vanishes rapidly upwards.

Hydrogen har en høy diffusjonskoeffisient (fire ganger høyere enn metan) og fortynnes raskt i luft. Hydrogen has a high diffusion coefficient (4 times that of methane) and dilutes rapidly in air.

Hydrogen har signifikant smalere detonasjonsgrenser i luft enn tenningsgrenser – ved tidlig antenning brenner hydrogen før detonasjonsgrensene er nådd. Hydrogen has significantly narrower detonation limits in air than explosion limits – when ignited early, it burns before detonation limits are reached.

Hydrogen brenner med usynlig flamme og svært lav varmestråling. Hydrogen burns with an invisible flame with very little heat radiated from the flame.

Hydrogen er fargeløs og luktfri. Hydrogen is colourless and odourless.



European Commission

H2moves.eu is part of the HyLights project which is funded by the European Commission under the Sixth Framework Programme.

www.H2moves.eu

Links to European Hydrogen Projects:

www.HFPeurope.org

www.zeroregio.de

www.hychain.org

www.hyways.de

www.global-hydrogen-bus-platform.com

www.HyLights.eu

www.roads2hy.com

www.hyapproval.org

www.hysafe.org

Hydrogen links:

www.infotools.HFPeurope.org

www.HyWeb.de

www.H2mobility.org

www.H2Stations.org

www.scandinavienhydrogen.org

www.h2euro.org

www.hydrogen.no

www.danishhydrogen.dk

www.hynor.no

www.hirc.dk

www.hydrogenlink.net

Links to the European Commission

www.ec.europa.eu

www.ec.europa.eu/transport/

www.ec.europa.eu/research/

Datacard compiled by:

Ludwig-Bölkow-Systemtechnik GmbH - www.lbst.de
Daimlerstr. 15 - 85521 Ottobrunn - Germany



Hydrogen for Transport in Europe

Datablad

Hydrogen

Data Card
Hydrogen



SIXTH FRAMEWORK
PROGRAMME

hydrogendata - hydrogen data

nedre brennverdi / lower heating value	3.00 kWh/Nm ³	10.8 MJ/Nm ³
	2.359 kWh/l LH ₂	8.459 MJ/l LH ₂
	33.33 kWh/kg	120 MJ/kg
øvre brennverdi / higher heating value	3.54 kWh/Nm ³	12.75 MJ/Nm ³
	2.790 kWh/l LH ₂	10.04 MJ/l LH ₂
	39.41 kWh/kg	141.86 MJ/kg
tetthet / density	0.0899 kg/Nm ³	70.79 kg/m ³ LH ₂
kokepunkt / boiling point	20.390 K (0.1013 MPa)	
nedre Wobbe indeks / lower Wobbe index	11.361 kWh/Nm ³	40.898 MJ/Nm ³
øvre Wobbe indeks / higher Wobbe index	13.428 kWh/Nm ³	48.340 MJ/Nm ³
spesifikk varmekapasitet / specific heat capacity	c _p = 14.199 kJ/kg/K	c _v = 10.074 kJ/kg/K
eksplosjonsgrense i luft / explosion limits in air	4.0 - 75.0 % by volume	
detonasjonsgrensene i luft / detonation limits in air	18.3 - 59.0 % by volume	
diffusjonskoeffisient / diffusion coefficient	0.61 cm ² /s	

Energiinnholdet i 1 Nm³ hydrogen tilsvarer 0.34 l bensin, 1 l flytende hydrogen tilsvarer 0.27 l bensin, 1 kg hydrogen tilsvarer 2.75 kg bensin (basert på nedre brennverdi).

The energy content of 1 Nm³ hydrogen is equivalent to 0.34 l gasoline, 1 l liquid hydrogen is equivalent to 0.27 l gasoline, 1 kg hydrogen is equivalent to 2.75 kg gasoline (based on lower heating value).

kompressibilitetsfaktor / compressibility factor (273.15 K)

Pressure [MPa]	0.1013	5	10	15	20	25	30	35	40	50	60	70	80	90	100
Compressibility factor	1	1.032	1.065	1.098	1.132	1.166	1.201	1.236	1.272	1.344	1.416	1.489	1.560	1.632	1.702

brenseldata (nedre brennverdi) - fuel data (lower heating value)

hydrogen / hydrogen	3.00 kWh/Nm ³	33.33 kWh/kg
råolje / crude oil	≈1 toe/t	≈11.6 kWh/kg
diesel / diesel	≈10 kWh/l	≈11.9 kWh/kg
bensin / gasoline	≈8.8 kWh/l	≈12.0 kWh/kg
metanol / methanol	4.44 kWh/l	5.47 kWh/kg
metan / methane	9.97 kWh/Nm ³	13.9 kWh/kg
naturgass / natural Gas (82 - 93 % CH ₄)	8.8 - 10.4 kWh/Nm ³	10.6 - 13.1 kWh/kg
propan / propane	25.89 kWh/Nm ³	12.88 kWh/kg
butan / butane	34.39 kWh/Nm ³	12.7 kWh/kg
bygass* / town gas*	4.54 kWh/Nm ³	7.57 kWh/kg

* (51 %_{vol} H₂; 18 %_{vol} CO; 19 %_{vol} CH₄; 2 %_{vol} C_nH_m; 4 %_{vol} CO₂; 6 %_{vol} N₂)

Tegnsetningen i dette kortet refererer til britisk standard.

Intet ansvar for korrekthet. / No liability for correctness assumed.

LH₂: 100 % para hydrogen
normal conditions: 273.15 K; 0.1013 MPa

konverteringsfaktorer - conversion factors

energi / energy

fra: / from: til: / into: ganges med: / multiply by:

MJ	kWh	0.2778
toe	kWh	11630
BTU	kWh	0.2931 x 10 ⁻³
kWh	MJ	3.6
toe	MJ	41868
BTU	MJ	0.001055

kWh	BTU	3412
MJ	BTU	947.9
toe	BTU	39.7 x 10 ⁶
kWh	toe	86.0 x 10 ⁻⁶
MJ	toe	23.88 x 10 ⁻⁶
BTU	toe	25.19 x 10 ⁻⁹

trykk / pressure

bar	MPa	0.1
psi	MPa	0.006895
MPa	psi	145
bar	psi	14.5
MPa	bar	10
psi	bar	0.06895

volum / volume

scf (288.7K; 0.1013 MPa)	Nm ³ (normal conditions)	0.0268
Nm ³ (normal conditions)	scf (288.7K; 0.1013 MPa)	37.33