Product data sheet hydrogen

Hydrogen is the lightest and most common chemical element in the universe. The name "hydrogen" is derived from the Latin word "hydrogenium", which means water producer.

On Earth, hydrogen is found almost exclusively in chemically bound form: it is a component of water and is found in almost all organic compounds.

Due to its physical and chemical properties, hydrogen is used in numerous industrial processes: as a fuel gas, as a shielding gas in heat treatment, as a reducing agent in the production of hard metals, in food technology, e.g. for the hydrogenation of fats, and in the electronics industry.

In addition to industrial use, hydrogen is playing an increasingly important role as an energy carrier. When it is burned with air, no CO_2 is emitted and only water is produced as a reaction product. In addition, hydrogen can be converted directly into electrical energy with oxygen in a fuel cell. Potential applications for hydrogen as an energy carrier range from emergency power supply to fuelling mobility in land, water and air to the CO_2-free production of steel.

Hydrogen can be produced using electrical energy from renewable sources by splitting (electrolysis) water. In addition, it can be stored efficiently for long periods of time. This is why hydrogen plays a key role in the climate-friendly energy system of the future as a flexible fuel and energy carrier.

Properties

Chemical Formula	H_2
CAS Number	1333-74-0
Molar mass	2.016 g/mol
Triple point	14.0 K (-259.2°C) and 72 mbar
Boiling point (liquefaction)	20.4 K (-252.8 °C) at 1.013 bar
Critical point	33.2 K (-239.9°C) and 13.0 bar
Relative density to air	0.07 (= 14 x lighter than air)
Ignition limits in air	75.6 vol% (upper ignition limit)
	4.0% vol (lower ignition limit)
Production / Origin	Electrolysis of water
	Steam reforming of methane or natural gas
	By-product of chlorine production (chlor-alkali electrolysis)
Properties	Colourless and odourless, non-toxic, flammable
Safety considerations	highly flammable, forms oxyhydrogen gas with oxygen (see safety data sheet)

Conversion factor

Volume at ambient pressure (15°C, 1 bar) in m^3	Volume at moderate pressure (15°C, 45 bar) in m^3	Volume at high pressure (15°C, 300 bar) in m^3	Weight in kg
11.89	0.2713	0.0473	1.000
1000	22.82	3.98	84.10

Purity classes

Hydrogen can be supplied in three purity classes as standard. % and ppm values are to be understood as ideal volume proportions.

Purity class	H_2 %	N_2 ppm	O_2 ppm	$CO+CO_2$ ppm	KW ppm	H_2O ppm
5.0	> 99.999	< 5	< 3	< 1	< 1	< 5
3.7/FC*	> 99.97	< 300	< 5	<2.2	< 2	< 5
3.0	> 99.9	< 1,000	< 50	-	-	< 100

* Suitable for fuel cells. Specification according to DIN EN 17124 & ISO/DIS 14687 (Type I/II D)

The availability of purity classes is sometimes regionally limited. Different purity classes (e.g. 4.8) on request.
To ensure the safety and purity of these high-quality products up to the point of consumption, only approved fittings may be used.

Product description

Hydrogen 3.7/FC, RFNBO

Hydrogen in purity class 3.7, suitable for fuel cells according to DIN EN 17124 & ISO/DIS 14687 (Type I/II D) and sourced from a plant certified for the production of hydrogen as *a Renewable Fuel of Non-Biological Origin* (RFNBO) in accordance with the Commission Delegated Regulation (EU) 2023/1184 or the 37th BImSchV. (BImSchV stands for Bundes-Immissionsschutzverordnung). Issuance of proofs of sustainability (POS) by Tyczka Hydrogen subject to availability and up to a maximum of the quantity purchased.

Hydrogen 3.7/FC, Green certified

Hydrogen in purity class 3.7, suitable for fuel cells according to DIN EN 17124 & ISO/DIS 14687 (Type I/II D), produced from renewable energy and certified (e.g. *GreenHydrogen* according to CMS70 TÜV Süd or RFNBO w/o proof of sustainability). Physical, mass balanced or balanced (Book & Claim) delivery according to availability and admissibility.

Hydrogen 3.7/FC, Green unspecified[1]

Hydrogen in purity class 3.7, suitable for fuel cells DIN EN 17124 & ISO/DIS 14687 (Type I/II D) and produced from renewable energy. Physical, mass balanced or balanced delivery according to availability (Book & Claim).

Hydrogen 3.7/FC

Hydrogen in purity class 3.7, suitable for fuel cells according to DIN EN 17124 & ISO/DIS 14687 (Type I/II D) and without proof of origin.

Hydrogen 5.0

Hydrogen in purity class 5.0 and without proof of origin.

Hydrogen 3.0

Hydrogen in purity class 3.0 and without proof of origin.

In addition to the above-mentioned pure products, mixtures (e.g. 50% hydrogen green) can also be supplied on request.

[1] To ensure security of supply, we use one of the following options to provide the green property of hydrogen: 1. Physical delivery from a production facility that uses only electricity from renewable energies. 2. Mass balanced delivery from a production facility that uses electricity from renewable energy sources; this means that the green hydrogen physically obtained from a production plant was also physically in the trailer of the respective delivery at least one time within the balancing period. 3. Balanced supply from a production plant that uses electricity from renewable energies; this means that the green hydrogen physically purchased from a production plant is only assigned to a customer on a calculatory basis. 4. Delivery in the so-called "Book & Claim" process through the cancellation of guarantees of origin for green hydrogen (GO) from production facilities that use electricity from renewable energies from which we do not necessarily purchase the hydrogen physically. In this case, the production plant is always certified by an external certification body.

Methods of delivery

Available from Tyczka HYDROGEN GmbH

Trailer, gaseous				
Type	Filling pressure* (bar at 15°C)	Capacity approx. (kg)*	Length incl. Tractor unit (m)	Width/Height approx. (m)
Trailer, 45 feet**	200	600-650	16.5	2.5/4.0
	300	880-950		
	380***	1,080,1.170		
Trailer, 40 feet	200	330	15.0	
	300	490		
	350***	560		
Trailer, 20 feet**	200	200-250	13.0	
	300	290-370		
	380***	450		

* maximum usable quantity at 20 bar back pressure. The filling is done by manometer. The filling pressure depends on the ambient temperature.
** different types
*** subject to availability

Available from Tyczka AIR GASES GmbH

Hydrogen in purity classes 3.0 and 5.0 is also available as cylinders in the following containers.

Single cylinder, gaseous						
Type	Volume (l)	Outer-Ø approx. (mm)	Length incl. cap approx. (mm)	Total weight approx. (kg)	Filling pressure* (bar at 15 °C)	Filling (m^3)
10	10	140	970	14	200	1.78
50	50	229	1,640	63	200	8.88

Pallets: Dimensions approx. L x W x H, 1090 x 800 x 1100 mm, weight empty approx. 110 kg.

Bundle of Cylinders, gaseous, 12 Cylinders, type 50, vertical in rack				
Volume (l)	Dimensions lxbxh ca. (mm)	Total weight approx. (kg)	Filling pressure* (bar at 15 °C)	Filling (m^3)
600	1.030 x 850 x 1.890	1,220	200	106.56
			300	150.72

* The filling is done by pressure. The filling pressure depends on the ambient temperature.

Not all products are available in every size. We look forward to your inquiry and will be happy to advise you!

Colour code DIN EN 1089, Part 3

Cylinder colour	Shoulder	Valve/bundle connection
Red RAL 3000	Red RAL 3000	W 21.8 x 1/14", left-handed thread (DIN 477, No. 1)

Properties, safety instructions and transport instructions can be found in the safety data sheets.