Hydrogen as a Carrier Gas

Market Application Publication

Background:

When selecting the proper carrier gas for gas chromatography (GC) , a laboratory manager traditionally has three choices; nitrogen, helium or hydrogen. Recent global supply issues related to helium have led to shortages and significant price increases in both gas costs and cylinder rental fees. As a result, many laboratories are re-evaluating the best carrier gas to provide maximum analysis time while offering safety and cost effectiveness.

Contact Information:

Parker Hannifin Corporation
Gas Separation and Filtration Division
4087 Walden Avenue
Lancaster, New York 14086

phone 800 343 4048
fax 877 857 3800

www.parker.com/gsf

Features and benefits:

- Eliminates dangerous and expensive hydrogen gas cylinders from the laboratory
- Exceeds OSHA 1910.103 and NFPA 50A safety requirements
- Safe - produces only as much gas as you need
- Unique electron beam palladium cell technology
- Produces a continuous supply of 99.99999+% pure hydrogen gas, ideal for carrier and fuel gas applications
- Flow rates up to 1300 ml/min and pressures up to 175 psig available
- Compact and reliable - only one square foot of bench space required and designed to run continuously 24 hours/day - includes automatic water fill
- Simple annual maintenance, no desiccant cartridges
- Certified for laboratory use by CSA, UL, IEC 1010, and CE Mark

Parker Balston

ENGINEERING YOUR SUCCESS.

Application:

The use of hydrogen as a carrier gas offers a reliable, safe and cost effective alternative to nitrogen and helium. The Van Deemter curves (below) illustrate the optimum velocity for H2 is significantly greater than nitrogen, which leads to faster analysis time and a more productive laboratory. Parker Balston Hydrogen Generators produce 99.99999% hydrogen which exceeds carrier gas purity requirements. The generators offer a safe source of hydrogen, producing only the required amount of gas and eliminates the need for high volume, high pressure cylinders.

Case Study:

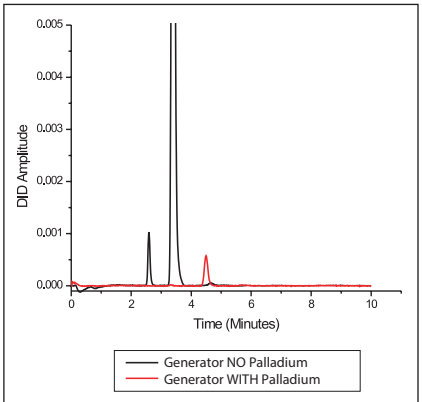
Henkel Loctite is a Rocky Hill, CT based producer of sealants, adhesives and coatings for the automotive, electrical and aerospace markets. Loctite's Analytical Services group supports the company's research activities by providing chemical testing of incoming raw materials, intermediates, new compounds and formulations developed to meet customer needs.

According to Robert Trottier, Manager-Analytical Services, there were several reasons to consider when selecting a carrier gas and a source of gas. "Helium tends to be relatively expensive, it's a nonrenewable resource," Trottier said. "Another problem is that the purity of commercial-grade helium can be less than ideal for some of the more sensitive analytical methods. We occasionally experienced problems with contaminants that generate background noise in our chromatograms, sometimes causing us to expend time trying to identify the source."

As a result of installing a Parker Balston Hydrogen Generator, Trottier adds "We save a considerable amount of money every year, avoid the time and difficulties involved in dealing with gas cylinders and produce purer gas more reliably with our on-site generator….The hydrogen generator more than paid for itself in the first year of operation and has generated savings of approximately $10,000 per machine or $20,000 total each year since."

Simple Experimental: The two merged baselines in the right chromatogram were created using a Gow-Mac Gas Chromatograph Series 590 equipped with a (DID) discharge ionization detector with hydrogen separator. In creating both baselines (black and red) the gas sample is hydrogen from a hydrogen generator. Both generators are the same - as hydrogen gas is produced from water via electrolytic disassociation, but differ slightly as one generator incorporates a desiccant drying tube as a final purifier while the second generator has a palladium membrane as the final purifier.

The large black peak represents a combined 12 ppm concentration of oxygen and nitrogen, suitable for hydrogen fuel gas while the corresponding point in the red baseline represents a combined 12 ppb concentration of oxygen and nitrogen, suitable for either fuel or carrier gas.



The purity benefit of using Hydrogen Generator with Palladium technology vs. non-Palladium technology

ENGINEERING YOUR SUCCESS.

Principal Specifications

Hydrogen Generators	Models	Specifications
Hydrogen purity		99.99999+%
Oxygen Content		< .01 ppm
Moisture Content		< 1.0 ppm
Max Hydrogen Flow Rate*	H2PD-150	150 cc/min
	H2PD-300	300 cc/min
	H2PEMPD-510	510 cc/min
	H2PEMPD-650	650 cc/min
	H2PEMPD-850	850 cc/min
	H2PEMPD-1100	1100 cc/min
	H2PEMPD-1300	1300 cc/min
Electrical Requirements		120 VAC/60 Hz, 3.15 Amps
Hydrogen Outlet Pressure		0 to 175 psig
Certifications		EIC 1010-1, CSA UL 3101; CE Mark
Outlet Port		1/8" Compression

Ordering Information

Description	Model Number
Electrolyte Solution	920071
Pressure Regulator	W-425-4032-000
Installation Kit	IK7532
Preventive Maintenance Contract	Call Customer Service at 800-343-4048
Extended Support with 24 Month Warranty	Call Customer Service at 800-343-4048

*Models available with flow rates up to 1200 cc/min. to accommodate split injection and high pressure needs.

2.2 Weight and Dimension

The demensions and weight of the equipment are specified below.

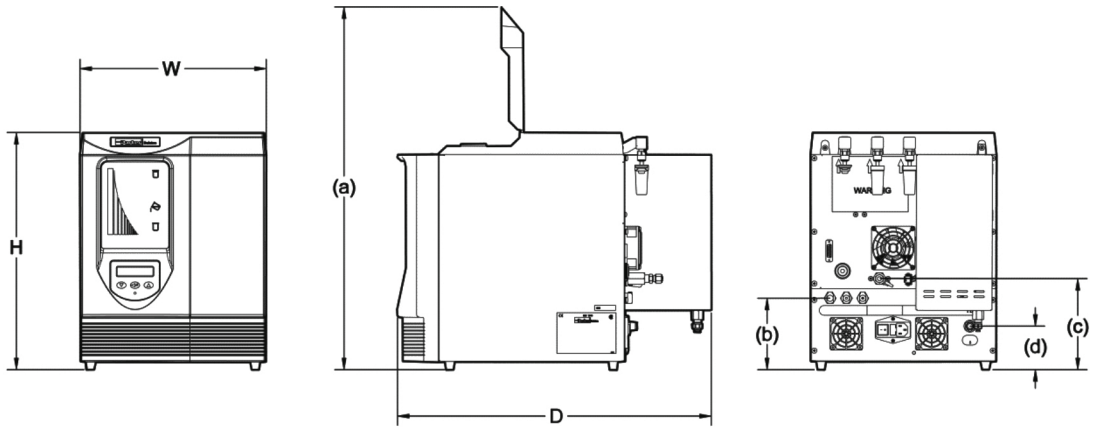


Figure 1

Dimensions	Units	H2PEMPD-510	H2PEMPD-650	H2PEMPD-850	H2PEMPD-1100	H2PEMPD-1300
H	in (mm)	17.1 (435)	17.1 (435)	17.1 (435)	17.1 (435)	17.1 (435)
W	in (mm)	13.5 (342)	13.5 (342)	13.5 (342)	13.5 (342)	13.5 (342)
D	in (mm)	21 (533)	21 (533)	21 (533)	21 (533)	21 (533)
(a)	in (mm)	25.4 (645)	25.4 (645)	25.4 (645)	25.4 (645)	25.4 (645)
(b)	in (mm)	4.3 (108)	4.3 (108)	4.3 (108)	4.3 (108)	4.3 (108)
(c)	in (mm)	4.4 (11.5)	4.4 (11.5)	4.4 (11.5)	4.4 (11.5)	4.4 (11.5)
(d)	in (mm)	2.3 (59.5)	2.3 (59.5)	2.3 (59.5)	2.3 (59.5)	2.3 (59.5)
Weight						
Water bottle empty	lb (kg)	51.4 (23.4)	51.4 (23.4)	51.4 (23.4)	51.4 (23.4)	51.4 (23.4)
Water bottle full	lb (kg)	60.2 (27.4)	60.2 (27.4)	60.2 (27.4)	60.2 (27.4)	60.2 (27.4)

Table 3

Parker Hannifin Corporation
Gas Separation and Filtration Division
4087 Walden Avenue
Lancaster, NY 14086
phone 800 343 4048
fax 877 857 3800
www.parker.com/gsf

MAP AGS-H2CarrierGas-B Reprinted 10/2013