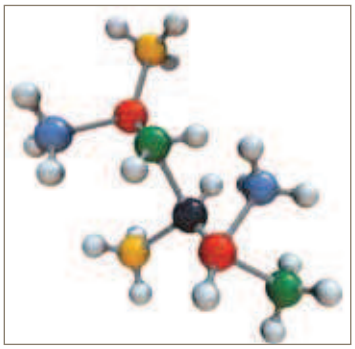

# Analytical Gas Systems

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker domnick hunter

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# Parker domnick hunter
# Technology you can trust

Parker domnick hunter is the leading provider of Gas Systems for the Analytical Instrument market. Generators are specifically designed to meet the stringent gas requirements for all the leading Analytical Instrument manufacturers including Agilent, Thermo Fisher, Waters, Shimadzu, AB Sciex, Perkin Elmer and many others.

Utilising Parker's range of patented proprietary technologies, there are 1,000's of systems installed worldwide. These technologies offer some unique performance benefits, including guaranteed ultra high purity gas, silent operation, minimal moving parts and minimal operator attention. It is **technology you can trust.**

### Improved instrument performance
Consistent gas quality and pressure improves stability and ensures greater reproducibility of results.

### Convenience
No changing of gas cylinders or liquid dewars. On-demand supply 24/7 - generate gas as and when required.

### Safety
Eliminate high pressure gas cylinders and liquid dewars from your laboratory.

Eliminates manual handling, reducing Health and Safety risks.

### Cost
Payback in less than 18 months. Minimal ongoing maintenance costs.
No more gas costs, delivery and rental charges.

# The End for High-Pressure Gas Cylinders?

High-pressure gas cylinders are a common sight in many laboratories: a default for supplying analytical instruments with their gas requirements, high-pressure gas cylinders are familiar and provide the gas that's required, so it could be said that the old adage, 'if it isn't broke, don't fix it', could well apply.

Despite this, increasing numbers of analytical instrument users are choosing to supply their GC FID, LC/MS and other types of instrument with gas via an analytical gas generator. Driving this decision will be a combination of factors broadly grouped into four areas; safety, cost, convenience and purity.

**Safety Concerns...**
High-pressure gas cylinders can provoke safety concerns in a number of different ways, some with potentially fatal consequences. The presence of high-pressure gas cylinders in the laboratory has been likened to sharing the laboratory with a potential missile. This stems from the behaviour of a cylinder that suddenly de-pressurises. There is enough force released with a European 'L' size cylinder to accelerate the cylinder to something like 66mph or 108km/h in around 1/10 seconds. Cylinders weigh in at 200lb (98kg), so there'll be enough momentum to cause some severe damage.

It's because of this potential 'missile scenario' that cylinders tend to be strapped down to something fixed. Even restrained, should a large cylinder suddenly vent its contents into the laboratory, then there are potentially fatal consequences. For example, if a high-pressure cylinder of nitrogen suddenly vented into the atmosphere of a laboratory, then more than 9,000 litres of un-breathable gas would be released. This would dramatically reduce the oxygen content of the air – presenting the possibility of asphyxiation. The risk of oxygen displacement from the atmosphere is also associated with liquefied gases whose volume will increase as much as 1,000 fold when in the gas phase. This means liquid nitrogen dewars can also be hazardous.

If the gas suddenly venting was a potentially explosive gas, as in the case of hydrogen, the result could be much more dramatic. Hydrogen will form an explosive mixture at just 4% volume in air.

These possibilities are the life threatening safety concerns associated with high-pressure gas cylinders. However, there is still the potential for other non-fatal injuries. The practice of rolling cylinders on their bottom edge comes with the risk of trapping toes or feet. With the 'smaller' cylinders there is also potential for heavy lifting injuries when being placed on a bench top.

**Costs Increase Whilst Convenience and Purity are Reduced...**
With high pressure cylinders the storage requirements are dictated by safety concerns, such as separating hydrogen cylinders and cylinders of oxidising gases. These often result in cylinders being some distance from where the gas is used and hence long gas lines. Whilst the longer gas lines result from the positioning of cylinders for safety concerns, the impact will be in the areas of cost, convenience and purity.

With any gas line there is the potential for leaks, and the longer the line the greater the potential. Hence the requirement to regularly leak-check the gas supply line – this both increases costs and decreases convenience - whilst leaks allow gas to escape and also allow impurities to enter the gas supply, which reduces purity and influences the accuracy of any analysis.

**A Smarter Choice...**
Analytical gas generators can remove the requirement for high-pressure cylinder gases for many analytical instrument users. Analytical gas generators are typically placed next to the instrument they're servicing. This removes any need for extended gas lines and with them associated problems impacting on purity, cost and convenience.

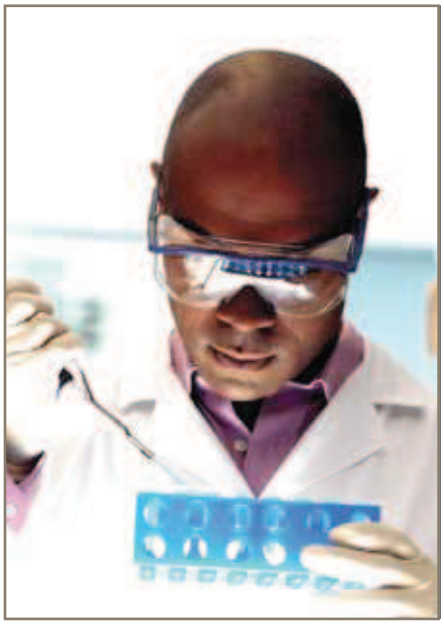
There are inherent features both in the design and the way in which generators operate which offer clear compelling reasons to switch from high-pressure gas cylinders. The latest gas generators utilise new technologies including adsorbents, catalysts, and specialist micro dryers, to produce ultra high purity gases. Generators are designed to be used at the point of use, simplifying and minimising the amount of pipe work, and guaranteeing ultra high purity gas reaching the instrument.

The generators are designed to run continuously with minimal annual maintenance and therefore minimal disruption to the gas supply. This all but eliminates the introduction of impurities, which can be reduced further by the installation of in line purifiers.

**Increased Safety...**
High-pressure gas cylinders will contain gas which is at a pressure of 200 to 300 times atmospheric pressure, and gas which is released to atmospheric pressure would have a volume in the region of 9,000 litres. Analytical gas generators operate at a fraction of this pressure and have very low volumes of stored gas within them. One of Parker domnick hunter's market leading hydrogen generators, for example, will have just 50 ml of stored gas, which will be at a maximum of around 5 times atmospheric pressure. Hence the missile concern is removed with a generator, and there's no large volume of gas to suddenly vent and make the atmosphere potentially explosive or deficient of life-supporting oxygen. Additional safety features are also incorporated in the design; for example, in Parker domnick hunter hydrogen generators there are leak detection auto shut-off devices.

**Increased Convenience...**
High-pressure gas cylinders will require regular replacement. Gas cylinders running out part way through analysis will result in unplanned downtime, and a replacement cylinder has to be collected and the old one removed which brings manual handling and safety concerns. After the new cylinder has been connected restarting the instrument, and waiting for stable baseline and

## *(continued)*



re-calibration, are required before samples can be run. Life is more convenient with a gas generator as there's no unplanned downtime. Analytical gas generators only require simple quick maintenance which can be planned for – they don't unexpectedly run-out of gas halfway through analysis.

**Increased Purity...**
Analytical gas generators provide a constant source of gas. This removes the variations in purity between cylinders, helping to improve sensitive analyses. Purity is also preserved because there is no chance for impurities to enter the gas pipes, which may happen as cylinders are switched and regulators changed-over.

**Reduced Cost...**
High-pressure gas cylinders can also prove to be costly: typical payback periods for analytical gas generators are short – sometimes less than one year. The cost of using high pressure cylinders is not just the cost of the gas itself but other charges, some of which can be seen and others which are hidden. Cylinder rental and delivery charges are readily apparent, however there's also hidden costs. These must also be included to reveal the true cost.

Unlike cylinders, Analytical Gas Systems have no hidden costs. There are no recurring costs with generators for activities such as ordering replacement cylinders, there are no storage costs for the spare and empty cylinders, and there is no cost of lost productivity through the need to stop and replace cylinders.

**Innovative Technology...**
Parker domnick hunter analytical gas generators are world renowned for their reliability, dependability and long life. Since commercializing their first laboratory scale analytical gas generator in the 1980s, Parker domnick hunter now serve an installed customer base of over 40,000 gas generator users globally.

Part of the reason behind this is the unique innovative technology employed in Parker domnick hunter generators, from carbon molecular sieve, to the use of robust hydrogen membranes.

**A Smarter Choice for LC/MS...**
Providing nitrogen for uses such as LC/MS, Parker domnick hunter's pressure swing adsorption nitrogen generators represent state-of-the-art technology. The carbon molecular bed simply and efficiently separates compressed air into nitrogen. The carbon molecular bed achieves this due to its selective adsorption capabilities for different gases – oxygen and other unwanted constituents of the compressed air are simply removed by desorption – the complete process is monitored by a sophisticated control system.

These generators, when connected to an existing compressed air supply, will provide a constant supply of nitrogen with limited moving parts inside the generator. This means that the generator is very quiet whilst operating and there are minimal replacement parts.

**A Smarter Choice for GC...**
Hydrogen offers advantages for GC users when used as a carrier gas. The Van Deemter curves illustrate the wide range over which high efficiency is obtained, making hydrogen the best carrier gas for samples containing compounds which elute over a wide temperature range. The risks associated with high-pressure gas cylinders have already been outlined – hence a gas generator is the smarter choice for hydrogen. The optimised design of Parker domnick hunter hydrogen generators take deionised water and, through electrolysis, separate the hydrogen. This is then purified using desiccants, and specialist micro dryers.

**An End For Cylinders?**
With the improvements that gas generators offer in the areas of safety, purity, convenience and cost there's little reason to use high-pressure gas cylinders with instruments such as GC and LC/ MS. The range of Parker domnick hunter analytical gas generators also extends its technologically innovative approach to other techniques such as FT-IR, TOC, ICP, ELSD and Atomic Absorption.

# Gas Generators for GC and GC/MS

# Hydrogen Generators

for GC combustion detector applications

The Parker domnick hunter H high purity hydrogen gas generators offer the optimum combination of safe operation, reliability and performance.

Utilising field proven PEM cell technology, hydrogen is produced on demand from deionised water and electricity, at low pressure and with minimal stored volume. Innovative control software allows unrivalled operational safety and reliability.

The H generators ideally supply fuel gas to all known GC combustion detectors used in today's laboratory workflows. Three models operate at flow rates; 160 ml/min, 250 ml/min and 500 ml/min.

Hydrogen generators are available with Remote Networking software. RemoteNet allows up to 27 hydrogen generators to be actively controlled from one central PC, and facilitates true cascading capabilities.

## Contact Information:

**Parker Hannifin Manufacturing Limited**
domnick hunter Filtration and Separation Division
Dukesway, Team Valley Trading Estate
Gateshead, Tyne and Wear
England NE11 0PZ

**Tel: +44 (0)191 402 9000**
**Fax: +44 (0)191 482 6296**
**Email: gasgen@parker.com**
**www.parker.com/dhfns**

## Product Features:

- **Eliminate dangerous hydrogen cylinders from the work place**
- **Simple to install and operate**
- **Compact, reliable with minimal maintenance**
- **Produces a continuous supply of 99.9995% pure hydrogen at up to 6.9 bar**
- **2 year standard cell warranty**
- **Optional automatic water fill and remote networking capability**

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## Product Selection

| Model | Flow Rate | Purity* | Water Consumption (24/7, full flow) | Delivery Pressure | | Optional Auto Water Fill (AWF) |
|---|---|---|---|---|---|---|
| | ml/min | % | L/week | bar g | psi g | |
| 20H | 160 | >99.9995 | 1.25 | 0.3-6.89 | 5-100 | YES |
| 40H | 250 | >99.9995 | 2 | 0.3-6.89 | 5-100 | YES |
| 60H | 500 | >99.9995 | 4 | 0.3-6.89 | 5-100 | YES |

*With respect to oxygen

Note: For auto water fill option add suffix AWF ie 20H-AWF

## Technical Data

| | | |
|---|---|---|
| Ambient Temperature Range | | 5 - 40°C<br>41 - 104°F |
| Water Supply Pressure* | | 0.1 bar g<br>1.45 psi g |
| Water Supply Flow Rate* | | 1 L/min |
| Water Quality | | Deionised. ASTM II, >1MΩ, <1µs, filtered to <100µm |
| Supply Voltage Range | | 90 - 264V 50/60Hz |
| Port Connections | Hydrogen Outlet<br>Water Drain<br>Water Fill* | 1/8" Compression Fitting<br>Quick Release Push in Fitting<br>Quick Release Push in Fitting |

*With optional AWF

## Weights and Dimensions

| Model | Height (H) | | Width (W) | | Depth (D) | | Weight (Empty) | | Weight (Full of Water) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | kg | lb | kg | lb |
| 20H | 456 | 17.9 | 342 | 13.5 | 437 | 17.2 | 19 | 41.9 | 23 | 50.7 |
| 40H | 456 | 17.9 | 342 | 13.5 | 437 | 17.2 | 19 | 41.9 | 23 | 50.7 |
| 60H | 456 | 17.9 | 342 | 13.5 | 437 | 17.2 | 19 | 41.9 | 23 | 50.7 |

## Preventative Maintenance

| Preventative Maintenance Kit | Part Number | Change Frequency |
|---|---|---|
| Replacement desiccant cartridge | 604970412 | As required* |
| 6 month kit | 604970600 | 6 months |
| 24 month kit | 604970532 | 24 Months |

* 20H Continuous operation approx 6 to 7 months
* 40H Continuous operation approx 4 to 5 months
* 60H Continuous operation approx 2 to 3 months

## Optional Extra's

| Description | Part Number | Required for |
|---|---|---|
| RemoteNet user software | 604971510 | up to two generators |
| RemoteNet user add on kit | 604971520 | each additional generator (604971510 required) |



Catalogue: 174004749_01_EN 03/11

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# Hydrogen Generators

for GC and GC/MS carrier gas applications

The Parker domnick hunter H-MD ultra high purity hydrogen gas generators offer the optimum combination of safe operation, reliability, performance and low cost of ownership.

Utilising field proven PEM cell technology, hydrogen is produced on demand from deionised water and electricity, at low pressure and with minimal stored volume. Innovative control software allows unrivalled operational safety and reliability.

The H-MD generators ideally supply GC and GC/MS carrier gas, in addition to all known combustion detectors that are routinely used in today's laboratory workflows. Four models operate at flow rates; 160 ml/min, 250 ml/min, 500 ml/min and 1100 ml/min.

Hydrogen generators are available with Remote Networking software. RemoteNet allows up to 27 hydrogen generators to be actively controlled from one central PC, and facilitates true cascading capabilities.

## Contact Information:

**Parker Hannifin Manufacturing Limited**
domnick hunter Filtration and Separation Division
Dukesway, Team Valley Trading Estate
Gateshead, Tyne and Wear
England NE11 0PZ

**Tel: +44 (0)191 402 9000**
**Fax: +44 (0)191 482 6296**
**Email: gasgen@parker.com**
**www.parker.com/dhfns**

## Product Features:

- **Eliminate dangerous hydrogen cylinders from the work place**
- **Simple to install and operate**
- **Compact, reliable with minimal maintenance**
- **Produces a continuous supply of 99.99995% pure hydrogen up to 1,100ml/min and 6.9 bar**
- **2 year standard cell warranty**
- **Optional automatic water fill and remote networking capability**

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## Product Selection

| Model | Flow Rate | Purity* | Water Consumption (24/7, full flow) | Delivery Pressure | | Optional Auto Water Fill (AWF) |
|---|---|---|---|---|---|---|
| | ml/min | % | L/week | bar g | psi g | |
| 20H-MD | 160 | >99.99995 | 1.69 | 0.69-6.89 | 10-100 | YES |
| 40H-MD | 250 | >99.99995 | 2.41 | 0.69-6.89 | 10-100 | YES |
| 60H-MD | 500 | >99.99995 | 4.82 | 0.69-6.89 | 10-100 | YES |
| 110H-MD | 1100 | >99.99995 | 10.60 | 0.69-6.89 | 10-100 | Standard |

*With respect to oxygen

Note: For auto water fill option add suffix AWF ie 20H-MD-AWF

## Technical Data

| | | |
|---|---|---|
| Ambient Temperature Range | | 5 - 40°C<br>41 - 104°F |
| Water Supply Pressure* | | 0.1 bar g<br>1.45 psi g |
| Water Supply Flow Rate* | | 1 L/min |
| Water Quality | | Deionised. ASTM II, >1MΩ, <1µs, filtered to <100µm |
| Supply Voltage Range | | 90V - 264V 50/60Hz |
| Port Connections | Hydrogen Outlet<br>Water Drain<br>Water Fill* | 1/8" Compression Fitting<br>Quick Release Push in Fitting<br>Quick Release Push in Fitting |

*With optional AWF

## Weights and Dimensions

| Model | Height (H) | | Width (W) | | Depth (D) | | Weight (Empty) | | Weight (Full of Water) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | kg | lb | kg | lb |
| 20H-MD | 456 | 17.9 | 342 | 13.5 | 470 | 18.5 | 20.5 | 45.2 | 25 | 55.1 |
| 40H-MD | 456 | 17.9 | 342 | 13.5 | 470 | 18.5 | 20.5 | 45.2 | 25 | 55.1 |
| 60H-MD | 456 | 17.9 | 342 | 13.5 | 470 | 18.5 | 20.5 | 45.2 | 25 | 55.1 |
| 110H-MD | 456 | 17.9 | 342 | 13.5 | 470 | 18.5 | 23.6 | 51.8 | 28 | 61.7 |

## Preventative Maintenance

| Preventative Maintenance Kit | Part Number | Change Frequency |
|---|---|---|
| 6 Month Kit | 604971500 | 6 Months |
| 24 Month Kit | 604970720 | 24 Months |

## Optional Extra's

| Description | Part Number | Required for |
|---|---|---|
| RemoteNet user software | 604971510 | up to two generators |
| RemoteNet user add on kit | 604971520 | each additional generator (604971510 required) |



Catalogue: 174004750_01_EN 03/11

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# The Analysis of 16 EPA PAHs by GC/MS using Hydrogen Carrier Gas.

**Mark Wilkinson (mark.wilkinson@parker.com),** James Heseltine (james.heseltine@parker.com)

Parker Hannifin Ltd

## AIM

The aim of this technical paper is to optimize and produce a robust and repeatable method for the analysis of 16 EPA PAHs by GC/MS using generated hydrogen carrier gas, over helium. This yields vastly improved analytical performance with shortened run times, whilst eliminating laboratory hazards associated with high pressure vessel usage, storage and handling.

## Introduction

Hydrogen is the choice of carrier gas for many applications, due to faster analysis times (compared with nitrogen and helium) with no reduction in resolution. In fact resolution is normally improved. However hydrogen's use as a GC/MS carrier gas has long been avoided. Reactions in the ion source, lack of pumping ability, and high background noise have all been cited as reasons not to use hydrogen as a carrier gas. Modern technology has to some extent allayed these concerns, but still helium continues to be used for many established methods. Generated hydrogen offers an analytically superior, cost effective and safe solution over and above cylinder fed helium.

One of the most common analytical studies performed in many environmental laboratories is the analysis of Polynuclear Aromatic Hydrocarbons (PAHs). PAHs are a group of compounds consisting of more than one benzene ring, found in fossil fuels, tar and various oils, as well as being formed by the incomplete combustion of carbon containing compounds, such as wood, coal and diesel, to name but a few.

The Environment Protection Agency (EPA) has designated 16 PAHs as primary pollutants. The detection and quantification of these compounds, especially in water and soils, is of paramount importance for human health and the environment, due to their toxic and carcinogenic nature.

Parker domnick hunter manufacture a range of hydrogen generators providing ultra high purity hydrogen gas without the safety concerns associated with high pressure cylinders. These generators improve analytical performance, shorten run times and maximise productivity.

## Analytical considerations

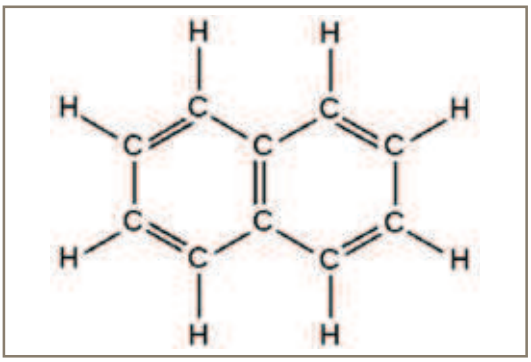
Analysis of the 16 EPA PAHs is normally carried out using GC-FID or GC/MS, with varying detection limits depending upon the medium in question and the analytical technique employed. GC/MS is favourable as it can eliminate non-required peaks, leaving only analytical information of interest, utilizing Single Ion Monitoring (SIM) mode. This is especially important in complex matrices, where peaks of similar composition may lead to false interpretation.

In any modern analytical laboratory, sample throughput and productivity are of utmost importance, where time is money.

Employing hydrogen as a carrier gas is very common in GC-FID workflows, yielding superior chromatography, as well as reduced run times. Whilst it's use within GC/MS workflows is less common, with the correct conditions, it has the potential to deliver superior performance benefits over and above helium, with the added incentive of enhanced safety and cost savings.

Typical GC/MS analyses use helium which, as well as having vagaries in supply, often at elevated cost, also necessitates the use of cumbersome, heavy, high pressure cylinders (up to 200 bar g) which must be changed on a regular basis.

A Parker domnick hunter hydrogen generator produces ultra high purity carrier gas at a constant pressure and flow rate, with minimal stored volume, eliminating laboratory hazards associated with high pressure storage vessels, such as cylinders.



Naphthalene

## Experimental

Analysis was performed on a Shimdazu QP2010s using SIM mode and splitless injection (www.shimadzu.com)

Hydrogen was supplied from a Parker domnick hunter 110H-MD generator (www.domnickhunter.com)

Column supplied by Phenomenex - Zebron ZB5MS 0.25mm X 0.25$\mu$m (www.phenomemex.com)

Injector - 300°C

Interface - 320°C

Ion Source - 250°C

Flow rate - 3ml/min (H2)

Injection volume - 1$\mu$l

**Oven Programme:-**

40°C (hold 1minute)

100 °C @ 15 °C/min (hold 10 minutes)

225 °C @ 5 °C /min (hold 0 minutes)

320 °C @ 15 °C /minute (hold 2 minutes)

Total run time = 48.33 minutes

Sampling time - 1minute

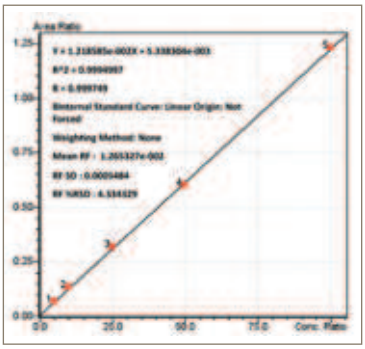
Control mode - Linear velocity

## Results

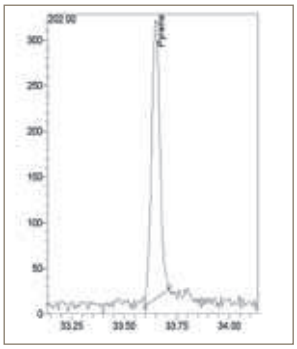
Detection limits of 1ppb were easily achieved, with excellent baseline resolution. 10 replicates were ran at this level, with typical RSD's of <0.1, and signal/noise (s/n) ratios varying between 5 and 20 (typically <10).

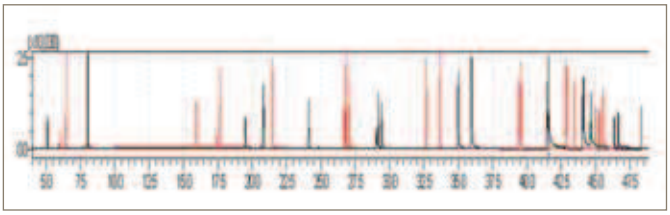
Standards were prepared in Dichloromethane over a range of 5 to 100ppb. Calibration over this range showed excellent linearity with all compounds being >0.995.

Benzo[ghi]perylene

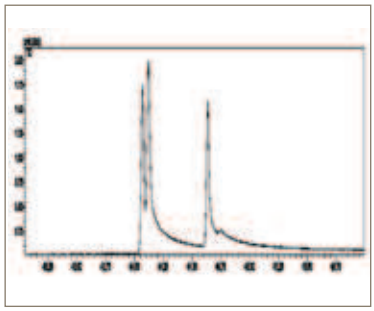


1 ppb Pyrene

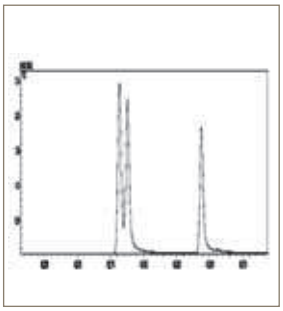




Late compound tailing - Helium



Elimination of peak tailing - Hydrogen



Typically, late eluting PAHs tend to tail, sometimes quite badly, making integration difficult, and peak asymmetry poor. In the above example, you can see clearly that the use of hydrogen carrier gas minimizes tailing, making integration easier to perform

As you can see from the comparison of the two chromatograms on the left hand side, hydrogen has many advantages over helium when it comes to chromatographic performance:-

- **Shorter run times, in this case, a saving of over 5 minutes**
- **Increase in sensitivity, which is important for trace level analysis**
- **Less peak tailing of later compounds, which is important for peak integration**
- **Near baseline resolution of later co-eluting peaks**

## Conclusion

In conclusion, hydrogen carrier gas, supplied by a Parker domnick hunter generator, provides all the necessary requirements needed to perform the analysis of low level Polynuclear Aromatic Hydrocarbons by GC/MS, with many distinct advantages over helium carrier gas.

As well as the analytical benefits, safety issues are also addressed through the elimination of the containment and handling of heavy, high pressure storage vessels, not to mention the danger of running out of gas unexpectedly. Instrument downtime through loss of gas and further column damage and loss of vacuum within the GC/MS system are extremely undesirable outcomes. Moreover, the volume of stored gas in a hydrogen generator is very small, and has built in safety features in case of a leak, shutting down the flow of hydrogen, thus removing the danger of the lower explosive limit being reached.

With the price of helium ever increasing, and vagaries in supply, there is a compelling case for ultra high purity generated hydrogen as a GC/MS carrier gas. With maximized instrument uptime of prime importance to many analytical laboratories, the use of hydrogen is a viable and safe alternative over and above helium.

Throughout this paper we have displayed a robust, repeatable and reliable method utilizing hydrogen as a carrier gas to reduce peak tailing, lower limits of detection, provide superior baseline resolution of co-eluting compounds with excellent calibration coefficients, over much reduced analytical run times.

Acknowledgements
The author would like to thank Alan Northage/ Sarah Caldwell at Shimadzu UK (www.shimadzu.com) and Louise Earley at Phenomemex (www.phenomenex.com)



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Product Information Sheet

# Hydrogen Generators

for ICP-MS instruments

The Parker domnick hunter 40H-ICP hydrogen gas generator, developed in collaboration with major instrument vendors, meets the initial purge and reaction gas requirements of the Collision Reaction Interface, providing simple routine removal of troublesome spectroscopic indifferences.

Utilising field proven PEM cell technology, hydrogen is produced on demand from deionised water and electricity, at low pressure and with minimal stored volume. Innovative control software allows unrivalled operational safety and reliability.

The 40H-ICP hydrogen generator employs a fully approved low-pressure buffer arrangement, to cater for elevated hydrogen flows required during the purge cycle of ICP-MS Instrumentation.

Hydrogen generators are available with Remote Networking software. RemoteNet allows up to 27 hydrogen generators to be actively controlled from one central PC, and facilitates true cascading capabilities.

## Contact Information:

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**Tel: +44 (0)191 402 9000**
**Fax: +44 (0)191 482 6296**
**Email: gasgen@parker.com**
**www.parker.com/dhfns**

## Product Features:

- **Designed specifically for ICP-MS**
- **Simple to install and operate**
- **Compact, reliable with minimal maintenance**
- **Eliminate dangerous hydrogen cylinders from the work place**
- **2 year standard cell warranty**
- **Optional automatic water refill and remote networking capability'**

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## Product Selection

Note: For auto water fill option add suffix AWF ie 20H-AWF

| Model | Flow Rate | Purity | Water Consumption (24/7, full flow) | Delivery Pressure | | Optional Auto Water Fill (AWF) |
|---|---|---|---|---|---|---|
| | ml/min | % | L/week | bar g | psi g | |
| 40H-ICP | 250 | >99.9995 | 2 | 0.3-6.89 | 5-100 | YES |

*With respect to oxygen

Note: For auto water fill option add suffix AWF ie 40H-ICP-AWF

## Technical Data

| | | |
|---|---|---|
| Ambient Temperature Range | | 5 - 40°C<br>41 - 104°F |
| Water Supply Pressure* | | 0.1 bar g<br>1.45 psi g |
| Water Supply Flow Rate* | | 1 L/min |
| Water Quality | | Deionised. ASTM II, >1MΩ, <1µs, filtered to <100µm |
| Supply Voltage Range | | 90V - 264V 50/60Hz |
| Port Connections | Hydrogen Outlet<br>Water Drain<br>Water Fill* | 1/8" Compression Fitting<br>Quick Release Push in Fitting<br>Quick Release Push in Fitting |

*With optional AWF

## Weights and Dimensions

| Model | Height (H) | | Width (W) | | Depth (D) | | Weight (Empty) | | Weight (Full of Water) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | kg | lb | kg | lb |
| 40H-ICP | 577 | 22.7 | 342 | 13.5 | 602 | 23.7 | 27.5 | 60.6 | 31.5 | 69.5 |

## Preventative Maintenance

| Preventative Maintenance Kit | Part Number | Change Frequency |
|---|---|---|
| Replacement desiccant cartridge | 604970412 | As required* |
| 6 month kit | 604970600 | 6 months |
| 24 month kit | 604970532 | 24 months |

* 40H Continuous operation approx 4 to 5 months

## Optional Extra's

| Description | Part Number | Required for |
|---|---|---|
| RemoteNet user software | 604971510 | up to two generators |
| RemoteNet user add on kit | 604971520 | each additional generator (604971510 required) |



Catalogue: 174004751_01_EN 03/11

Parker domnick hunter

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